Summer 2005

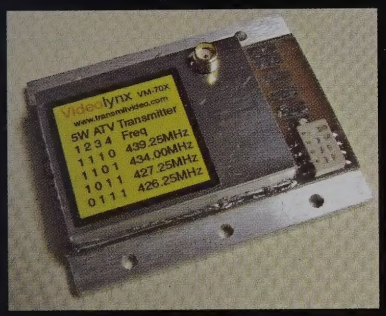
Volume 18 - No 3

ISSN 1042-198X
USPS 003-353

SINGLE ISSUE
$5.50 USA
$6.00 CANADA
$8.00 ELSEWHERE

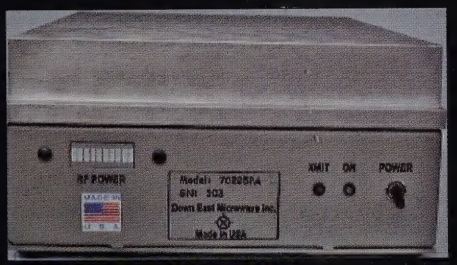
AMATEUR TELEVISION QUARTERLY

NEW PRODUCTS!



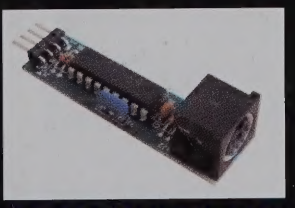
FROM VIDEOLYNX PAGE 37

FROM HARLAN TECHNOLOGIES PAGE 38



FROM DOWNEAST MICROWAVE PAGE 36

FROM MFJ PAGE 31



FROM MULTILABS PAGE 29

**********AUTO**ALL FOR ADC 606
EXPIRES:
HENRY RUH AA9XW
5317 W 133RD AVE
CROWN POINT IN 46307-4292

P. C. Electronics 2522 Paxson Lane Arcadia CA 91007-8537 USA ©2005

Tel: **1-*626*-447-4565** m-th 8am-5:30pm pst (UTC - 8) Tom (W6ORG) & Mary Ann (WB6YSS)

24 hr FAX order line 1-*626*-447-0489 Email: Tom6org@hamtv.com

PC ELECTRONICS

See the Fun ATV applications at www.hamtv.com!

Antennas, R/C, Baloons, Rockets, ARES/RACES app notes, repeater design, DX and more on page 3.

Get on ATV Quickly and Easily with our 20Watt ATV Transceiver
Now with audio AGC for improved sound

TC70-20S
ONLY $579

Total unit price shipped within 24 hrs of your call via UPS surface in the contiguous USA, Visa/MC

A pair of these can really give an Emergency Operations Center a better feel for what is going on at an incident site - a must for any ARES/RACES group.

All you need for 420-450 MHz ATV in one box!

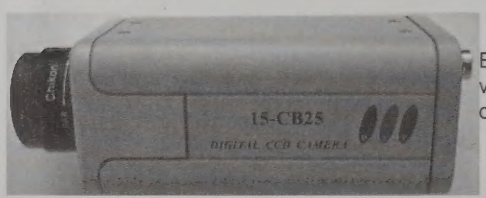
Got the ATV Bug ?

≥20 Watts

P.E.P. output, adjusts as low as 2 Watts for driving 100 Watt amps like the Mirage D1010N-ATV.

Made in USA.
Sales only to licensed Radio Amateurs and for legal Part 97 applications.

CAMERAS



BNC video out

CB25 Low Cost Color Camera.....$185
Perfect for the ham shack, but also good for mobile or portable with our ATV transmitters. 420 lines of resolution,1/3" Sony CCD, 1 lux, 6mm adjustable focus CS mount lens, 12Vdc @ 300 ma / 110 VAC wall plug power supply (camera draws 140 ma). Size 4.1 x 1.8 x 2.25", 13 oz.

LB-1000 mini color camera.$99
1.5" w., 2oz., *420* lines, 6mm lens, Sony CCD, mic/line audio output, takes just 9Vdc @50ma. RCA Audio/ Video output jacks.

Great for R/C
.75"

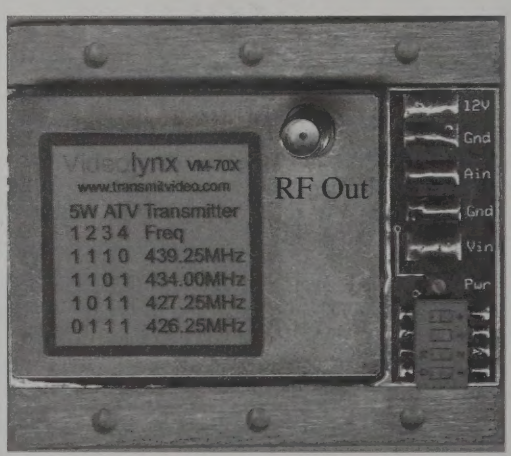
BC-20 Sub-Mini Color Camera.....$99
Little CMOS color camera weighs 1 oz, 330 lines of resolution, 1.0" x .75" square. Lens will focus from infinity to 1" from the object. RCA video jack. 9 to 12Vdc @ 40 ma, 9V wallplug power supply included.

New Videolynx 4 Watt p.e.p. ATV Transmitter

Model VM-70X has:

- Adjustable power output from zero to over 4 Watts p.e.p.
  >1/2 W output requires additional heatsink and/or fan
- Small size and weight 2.35"W x 2.8"L x .75"H & 1.8oz.
- 4 ch digiswitch select: 426.25, 427.25, 434.0 or 439.25
- Both video carrier and sound subcarrier are crystal locked
- Line Level video and audio inputs.
  internal video and audio test mode
- Runs on 11 to 14 Vdc.
  At 1/2 W current draw is 380 mA and 1A at 5W
- 50 Ohm SMA jack RF output

Price **$199**



+11 to 14 Vdc
DC ground
Audio in
A/V ground
Video in
Power set pot
Channel select

FREE UPS surface shipping in the contiguous USA on orders over $70

http://www.hamtv.com 7/2005

Hams, ask for our free ATV catalogue or download from our web site - AM, FM, 70cm to 10GHz

Check out our new *Specials & Surplus* web site page regularly!

MANN'S ROTOR SERVICE

Sales and Service

New & Reconditioned Rotors & Control Boxes

Service On Ham Rotors & Controllers

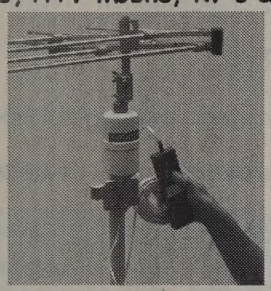
303 East 14th St.
Robinson, IL 62454

Gene Mann
(618)544-7388

6 Volt Antenna Rotor!

Intro Price - $49.95

Uses 4 AA Batteries
Perfect for Emergency Vehicles
Rovers, ATV Mobile, RV's & Boats



Save 10%
Use Code:
ATV10

Plasti-Dip & Liquid Electrical Tape

Starting at just $4.75

Eliminate water in connectors!
Permanent seal is easier to apply.
and better than sticky alternatives.
Removes easily without mess!
1000's of other uses too!

THE K1CRA Radio Store

www.k1cra.com
1-888-248-3484
5435 So. Abbott Rd
Orchard Park, NY 14127

Plasti-Dip - Degen Designs Antennas - DK9SQ 33' Mast and Antennas
RF Connectors, Raine Radio Cases and Much More!

VHF Communications

- A Publication for The Radio Amateur Worldwide
- Articles Covering VHF, UHF and Microwaves
- Design, Construction and Testing Information
- PCBs and Kits Available

Four magazines per year, £19.00 cash or £20.00 credit card, including surface mail delivery

For more information or to subscribe – http://www.vhfcomm.co.uk
email - vhfsubs@vhfcomm.co.uk

63 Ringwood Road, Luton, Beds, LU2 7BG, U.K. tel / fax +44 1582 581051

On-Screen ID Overlay

OSD-ID (PC) is an on-screen display board that overlays user defined text onto either an incoming video source or self generating background screen. Every position on the 28 column by 11 row screen (308 characters total) can contain a user selected character. All information is stored in non-volatile eeprom memory so even with loss of power OSD-ID (PC) retains all screen information. The on-screen text is created using a robust editor called IdMaker which runs under Microsoft Windows. IdMaker includes an integrated upload utility which sends the user created screen to the OSD-ID (PC) board through a supplied RS-232 serial cable. OSD-ID (PC) has two screen modes, a "mixed" (black and white text overlaid onto an incoming video source) mode and a "full page" (OSD generated color background) mode. OSD-ID (PC) supports screen background, character border, and character background color selection. Character border and pixel offset can be set for each of the eleven rows. In addition, programmable character zoom levels, horizontal and vertical pixels positioning, individual color and blink character attributes can also be set. And finally, the user can define OSD-ID (PC)'s text triggering method. 3.5" x 2.5" $139 includes serial cable and 3 1/2" diskette.

Intuitive Circuits, LLC
Voice: (248) 524-1918
http://www.icircuits.com

If You Move

Please send us your NEW ADDRESS! We pay 70 cents for each returned ATVQ. And we are usually nice and send another copy to your new address which costs us $1.29. Please help us from having to do this. Thanks!

AMATEUR TELEVISION QUARTERLY

Published by
Harlan Technologies

Publisher/Editor
Gene Harlan - WB9MMM

Contributing Editors
Mike Collis - WA6SVT
Bob Delaney - KA9UVY
Klaus Kramer - DL4KCK
Tom O'Hara - W6ORG
Ron L. Sparks - AG5RS

Editorial Office
5931 Alma Dr.
Rockford, IL 61108
(815) 398-2683 - voice
(815) 398-2688 - fax

Internet:
http://www.hampubs.com
email: **ATVQ@hampubs.com**

Amateur Television Quarterly (ISSN 1042-198X) is published quarterly, in January, April, July, and October for $20.00 per year by Harlan Technologies, 5931 Alma Dr., Rockford, Illinois 61108-2409. Periodicals Postage Paid at Rockford, IL and additional mailing offices. POSTMASTER: Send address changes to:
Amateur Television Quarterly,
5931 Alma Dr., Rockford, IL 61108.

Amateur Television Quarterly is available by subscription for $20.00/yr in the USA; $22.00/yr in Canada; $29.00/yr elsewhere. Single issues $5.50/USA; $6.00/Canada; $8.00 elsewhere.
Send all address changes to:
Amateur Television Quarterly,
5931 Alma Dr., Rockford, IL 61108

copyright 2005
Harlan Technologies

Amateur Television Quarterly

TABLE OF CONTENTS

Editors Notes	5	*Gene Harlan - WB9MMM*
Hamfest Repeater Filter	6	*Gene Harlan - WB9MMM*
Midwest ATV DX Report	9	*Bob Delaney - KA9UVY*
Interim Report On Modulating The Magnetron	12	*Heru Ra Walmsley - W3WVV*
Science Project For Kids	14	*Heru Ra Walmsley - W3WVV*
More On Transmission Lines	16	*Heru Ra Walmsley - W3WVV*
W9DUA Field Day with ATV Activities	17	*Leonard McWhorter - N9XHU*
20th Annual Banquet	17	*Scott Millick - K9SM*
Great Plains Super Launch 2005	18	*Zack Clobes - WØZC*
Painter Pole Revisited	21	*Scott Montgomery - N9GLL*
Amateur Television Contest 2005	24	*ATVQ*
Welcome To The Digital World III	26	*Henry Ruhwiedel - AA9XW*
Coax Questions	27	*Henry Ruhwiedel - AA9XW*
Welcome To The Digital World IV	28	*Henry Ruhwiedel - AA9XW*
Multilabs ezKEY Keyboard Adapter	29	*Multilabs*
Radar on 434 MHz	29	*Tom Weeden - WJ9H*
DBs For The Math Challenged	30	*Henry Ruhwiedel - AA9XW*
New Accessories From MFJ	31	*MFJ*
ATVQ Appreciation	31	*Dennis - WA7DRO*
More GPSL	31	*Bill Brown - WB8ELK*
Get A Grip On Clamps, Bias, And AC-Coupled Video Signals	32	*Dallas-Maxim*
New Downeast 225 Watt 70 cm Amp	36	*Tom O'Hara - W6ORG*
New Videolynx 0-4 Watt ATV Module	37	*Tom O'Hara - W6ORG*
New Cameras From Harlan Tech	38	*ATVQ*
AGAF At Ham Radio Fair In Germany	39	*Translation by: Klaus Kramer - DL4KCK*
ATVQ To Pay For Articles	40	*ATVQ*
Contributors Guide	40	*ATVQ*
Advertiser Index/List Of ATVQ Stores	41	*ATVQ*

Editors Notes

This issue we are happy to announce several new products. New stuff is always fun!

Tom, W6ORG, has written about two of them, the new Videolynx 4 watt p.e.p. ATV transmitter, VM-70X, and the Downeast Microwave 225 watt p.e.p. 70 cm linear amp.

At our booth at the Dayton Hamvention, we had the Videolynx VM-70X transmitter and sold everyone that we had! Everyone loved the size and had their own ideas as to how they would use it. After reading Tom's write-up (page 37), I can't wait until I can play with one of these. I actually got one, and have been showing it at hamfests that I go to (with great reaction), but have not had the time to hook up power and play. There is something about putting out a magazine that slows down the ability to play with the toys.

I see the Downeast 225 watt amp as being a very popular item. All those ATV repeaters on the 440 band will see a power boost soon! A 28 volt power supply with 12 amps may take a little looking to find, so it is good that Downeast is preparing to provide a supply that can be used. I was able to find a switching supply rated at 15A that is being used currently on our ATV repeater and was about $40, I think.

And we started carrying some color cameras to sell at hamfests and through the magazine. They are pretty nice with 420 lines, NTSC, and come with a Varifocal 6-15 mm - f1.4 (zoom) lens. Most cameras of this type seem not to come with a lens, but I figured that at a hamfest, most would want something to get started with. The lens mount is C/CS so a variety of lenses can be acquired if something different is wanted in the future. And the cameras come with a short 3" tripod!

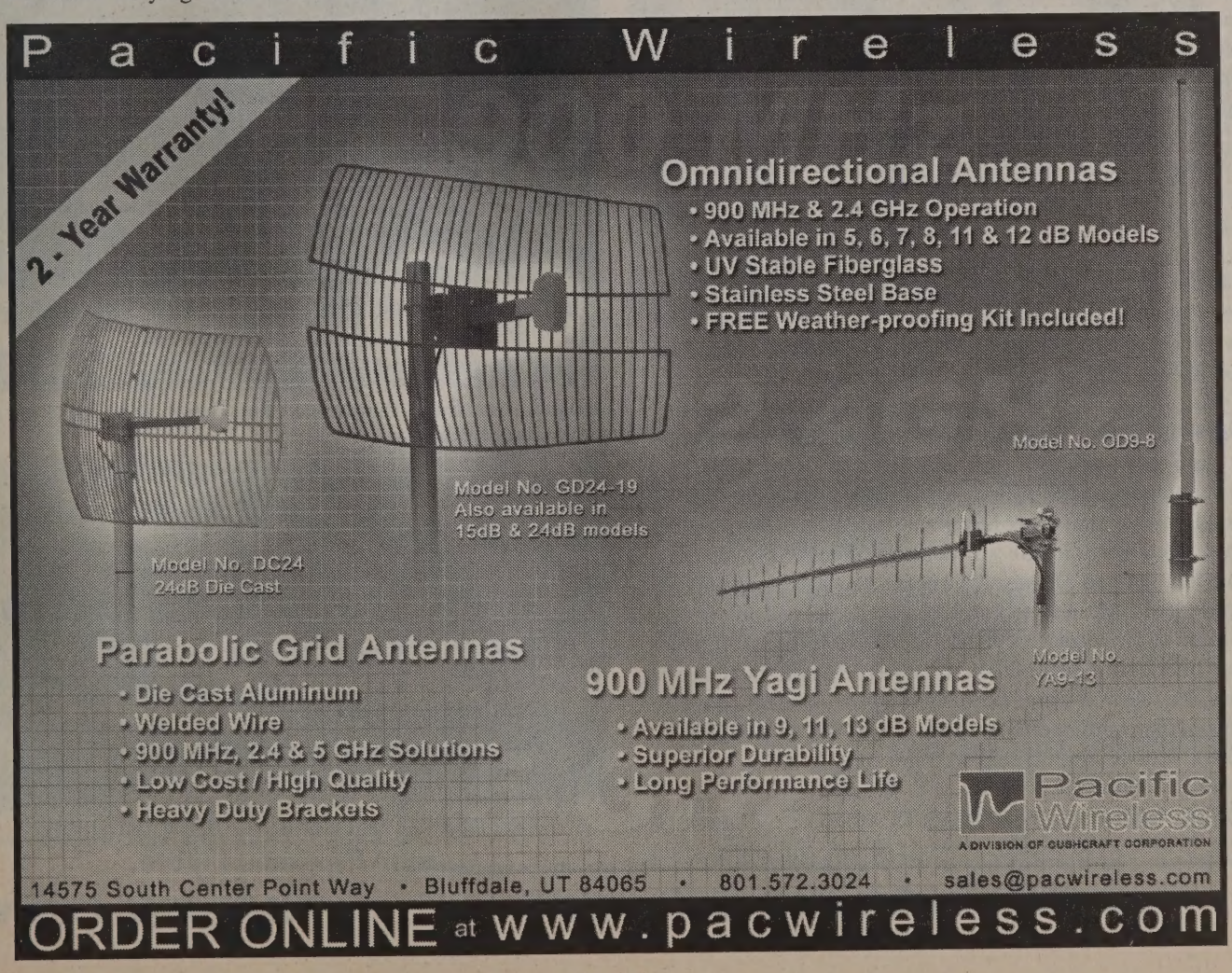
One of the cameras goes down to 1 lux, so it will work for most applications around the shack. The other camera is a Day/Night camera. What it does is use color until it gets to 0.5 lux at which time it switches to black and white, continuing to work down to 0.01 lux (pretty dark).

We also have wall type power supplies to supply 12 volts DC if you need, twin cables, one side for power, one side for video with BNC on one end and RCA on the other. And I found a couple of cute tripods to go with these items. So far, the small tripods are the hottest items I have so far. I hope by the time this actually hits the street to have our web page updated with these new items, so check us out.

Enjoy the rest of the articles as well. Heru, W3WVV, has written some, Henry, AA9XW, and Zack, WØZC, has written about the Great Plains Super Launch plus others.

Gene - WB9MMM
ATVQ

ATVQ


Pacific Wireless
2-Year Warranty!
Omnidirectional Antennas
• 900 MHz & 2.4 GHz Operation
• Available in 5, 6, 7, 8, 11 & 12 dB Models
• UV Stable Fiberglass
• Stainless Steel Base
• FREE Weather-proofing Kit Included!
Model No. CD24-19
Also available in
15dB & 24dB models
Model No. DC24
24dB Die Cast
Model No. OD9-8
Parabolic Grid Antennas
• Die Cast Aluminum
• Welded Wire
• 900 MHz, 2.4 & 5 GHz Solutions
• Low Cost / High Quality
• Heavy Duty Brackets
900 MHz Yagi Antennas
• Available in 9, 11, 13 dB Models
• Superior Durability
• Long Performance Life
Model No.
YA9-13
Pacific Wireless
A DIVISION OF CUSHCRAFT CORPORATION
14575 South Center Point Way • Bluffdale, UT 84065 • 801.572.3024 • sales@pacwireless.com
ORDER ONLINE at www.pacwireless.com

Hamfest Repeater Filter

By: Gene Harlan - WB9MMM - Email ATVQ@hampubs.com
5931 Alma Dr.
Rockford, IL 61108

The ATV repeater in Rockford, IL appears to need more filtering on the inputs and outputs to, hopefully, get a better picture. We are using 421.25 MHz as the output, and 434 MHz and 1.253 GHz as the input frequencies.

The 434 MHz is close and seems to be overpowered from the 421.25 when the transmitter is on. When the repeater is transmitting with just the ID, the picture quality can not be complained about. And the picture quality being received at the repeater is great as well. So, it appears that we need filters on the 421.25 MHz transmit and the two receive frequencies.

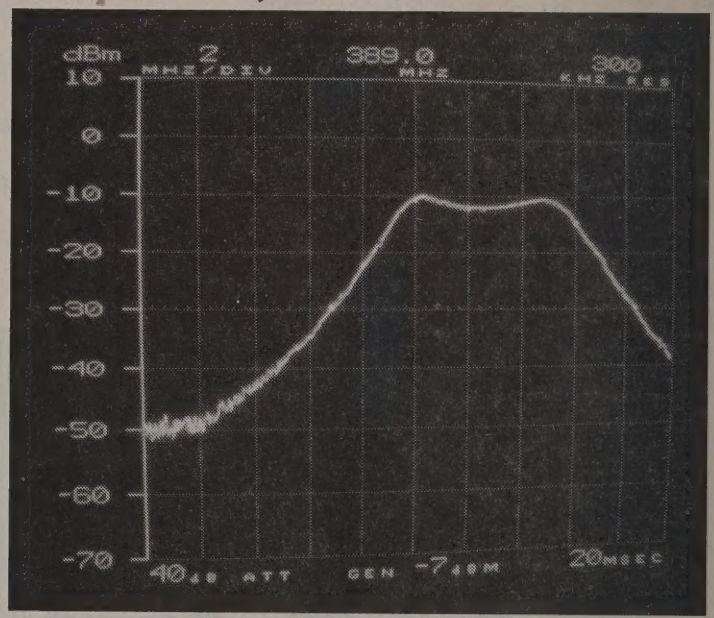
As mentioned in a previous article, "Needed, A Better Filter For Maley One-Antenna ATV Repeater," written by Robert F. Stone, W3EFG, (Spring 2005) our repeater also uses one antenna, but horizontal polarization. Ours is a rib cage slot - horizontal, for input and output of the 440 signal. We may end up needing the same filter from DCI that they mentioned.

Another article, "23cm In, 70 cm Out, Cross Band ATV Repeaters, Beware the 3rd Harmonic Lock-up!," written by Ron Fredricks, K8DMR, (Winter 2004 ATVQ) also addresses the situation we have due to the 1.253 GHz input being almost the third harmonic of the 421.25 MHz transmitter signal. We are using one of those 23 cm traps made from an "N" T connector and, while we did have a kerchunking problem, it seems to have solved the problem. In that issue, ATVQ did a test and pictures showing the results of using the "T" for a filter were displayed.

Also in the Winter 2004 ATVQ, another article, reprinted from Winter 1992 ATVQ, "440 QRM Filter" written by Henry Ruhwiedel, AA9XW, showed how easy it is to build a filter that looked like it might be useful with our problems. Well, it might be if you can find the 1 3/4" copper pipe. Seems like it should not be too hard, until you find that all the local fix it yourself super store only carry up to one inch diameter copper pipe. So I started calling around to the more specialized hardware type stores, plumbers, mail order hardware dealers, and even tried the Internet. Even here, Google was not helping me! So, I did not get to build that one. However, someone else had found the materials, and I was able to purchase two completed filters that work good at the Madison (WI) hamfest this Spring. And both of them only cost me $20! I could not have bought the materials for that. But, slow as I am, I still have only tried them here at the house (transmitting on 434 MHz - receiving on 421.25 MHz) and it does seem to help with my end.

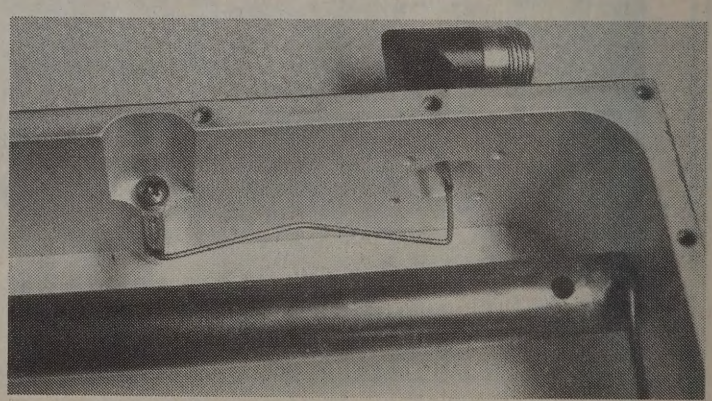
One of our members of the RARA-ATV group here, Dick Tidberg, WF9J, loves to help out when he can, and at two different hamfests he stoped by our table and said "here, see if you can use this." When I asked what it was (OK, I knew it was a filter of some sort), he said that it was a wide band filter that we might be able to use on the ATV repeater. Of course I got it home and it laid around for a bit.

When I finally checked it out, I found that it had about a 6 MHz passband from about 390 MHz to 396 MHz. The picture shows the before waveform a little messed up as I played with the controls, so it is not exactly as I received it.

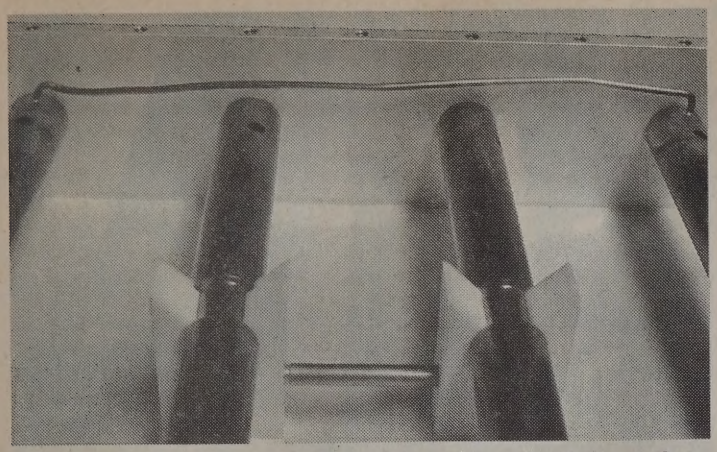


"Before" Waveform - was about 390-306 MHz

It was not too long before I opened it up to see what the insides looked like. I found things that I understood and some I did not.

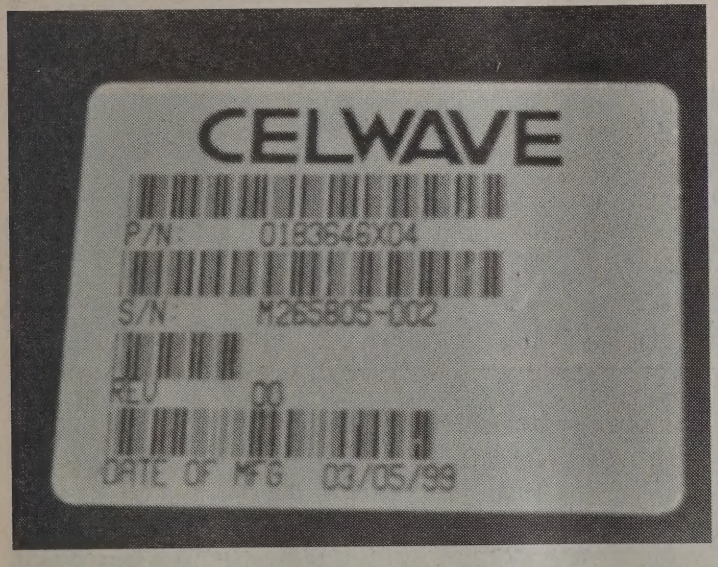


Matching network - a little different than I've seen before.



Two of the things I had not seen before - the wire from one end rod to the other end, and the short rod in the middle.

The input/output matching network was different than any I had seen or read about, as was the fact that there was a wire going from close to the base of the two outer rods. And there was a rod in the middle of the unit, which if you moved it, made a huge difference in the output waveform. Well, I guess I have not read everything that there is to read and understand about filters yet! But I keep working on it.

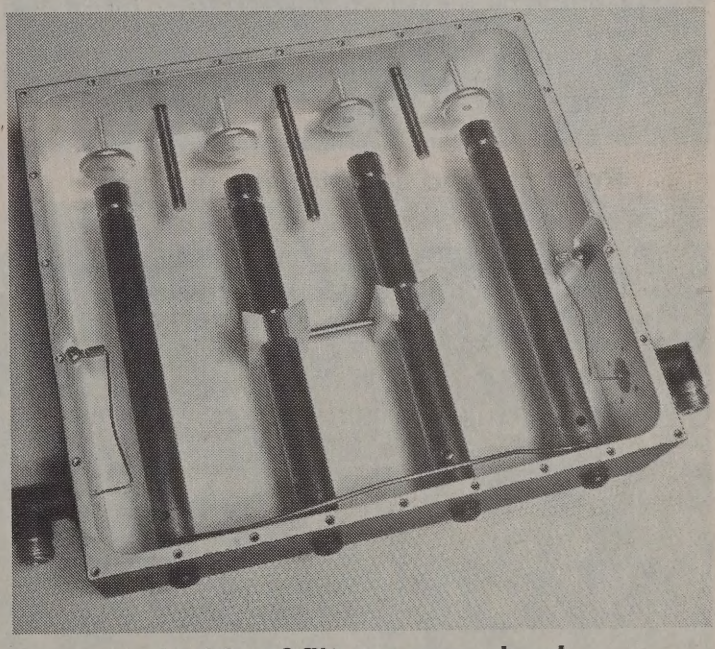


Label

So, how can I make this filter do something good for the repeater. Since we have two, it would be nice if one could be re-tuned for 421.25 MHz and the other for 434 MHz. OK, and how to do that. Previous articles state that the rods should be a little less than a quarter wavelength. No where have I found how much shorter. Cut and try, I guess?

So, I calculated first what I thought that the length of the rods should be for the "as found" frequency, and then for the "want to

Outside of filter - nice!



Inside of filter - even nicer!

THE R. F. CONNECTION

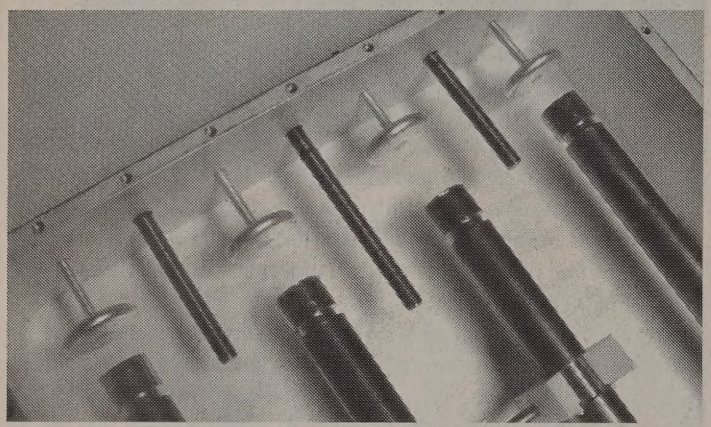
"specialist in
R F Connectors and Coax"
http://www.therfc.com

301/840-5477
Fax 301/869-3680
e-mail: rfc@therfc.com

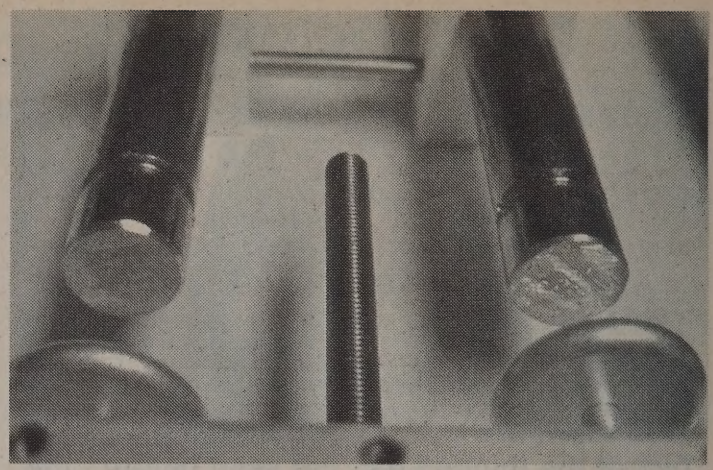
Order Line 800-783-2666
Suite 11, 213 N. Frederick Ave.
Gaithersburg, MD 20877

be" frequency. I decided to try cutting a quarter of an inch from each rod. I used a bandsaw and carefully cut the ends of each rod. It was harder for the outside two as I did not want to mess with the wire connecting the outside two rods.

Well, sometimes I amaze myself. When I put it all back together, I was able to tune it up to 421.25 MHz, with almost all of the adjustments turned all the way in (all but two). The bandwidth is a little wider than I wanted as it goes from close to 420.6 MHz to 429.2 MHz. But, I am anxious to give it a try to see if it helps the de-sense issue.



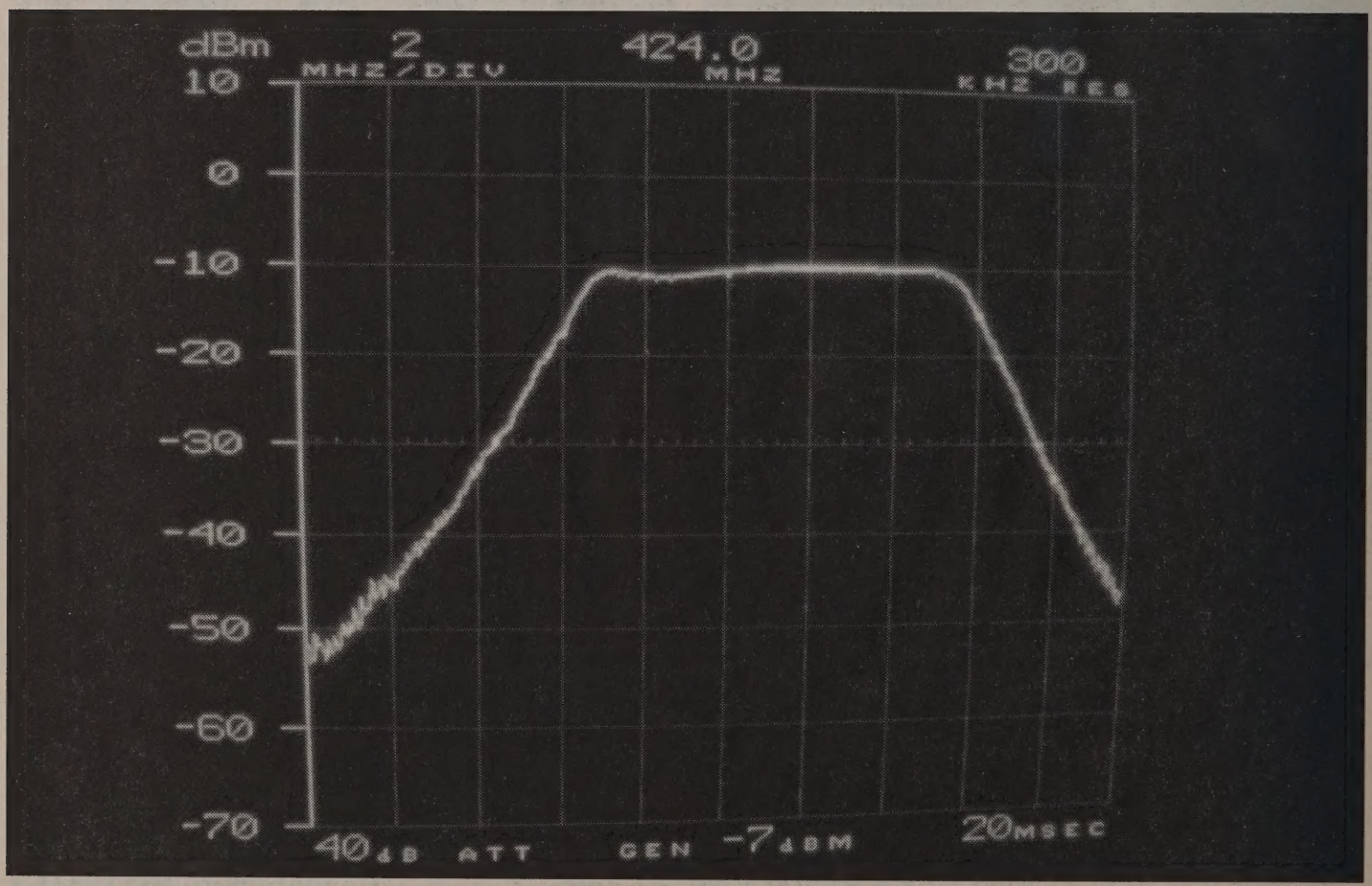
Rods cut and adjustments in place



Ends of cut rods

I definitely am not an expert at filter design, but I have found you learn by trying as we do every day. I would hope that someone will see this article and write about their experience, tell me (us) what I should have done as opposed to what I did, or what was this filter originally used for.

ATVQ



Final waveform showing passband from 420.8 to 429.2 MHz (display centered at 424 MHz)

Midwest ATV DX Report

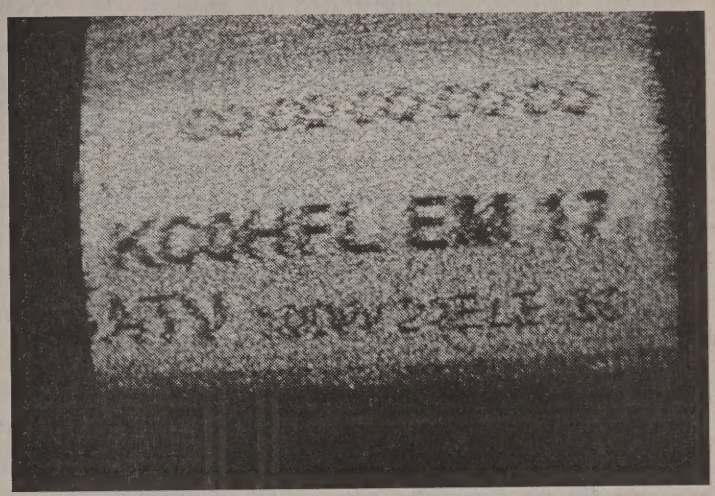
By: Bob Delaney - KA9UVY - Email KA9UVY@hotmail.com
10630 N. Delaney Lane
Mt. Vernon, IL 62864
DX Hotline 618-242-7063

05/13/05
11:35z KC0HFL of Wichita, KS, reported seeing the Dallas, TX, ATV repeater at a P-3 signal level. Bob also reported seeing it on 05/22 and again on 05/28.

06/04/05
11:39z KC0HFL reports reception of K5OJI/R carrying channel 4 radar coming into Wichita, KS.

06/22/05
13:00z K9KK, Rick, of Norman, OK, and KC0HFL, Bob, of Wichita, KS, finally made their first 2-way video contact. These two Western DX'ers have very few ATV stations to work unless the band opens to the East. KC0HFL received K9KK at P-3 to P-4 signal levels but his photos did not come out. Rick, K9KK, received KC0HFL at about P-3 and could hear his Echolink audio coming over the TV picture. Rick sent along a couple of pix.

06/18/05
00:00z K0PFX, Mel, of St. Louis, Mo, reports a great temperature inversion after a storm front passed through the Midwest. Even though Mel's tower was cranked down to only 30 feet, he worked several S. IL stations at 75 to 100 miles and Springfield, IL, stations N9XHU and K9KKL. K9KKL was so good he got the camera about and took this shot:



Nice signal from 77 miles and the antenna only 30 feet above ground!

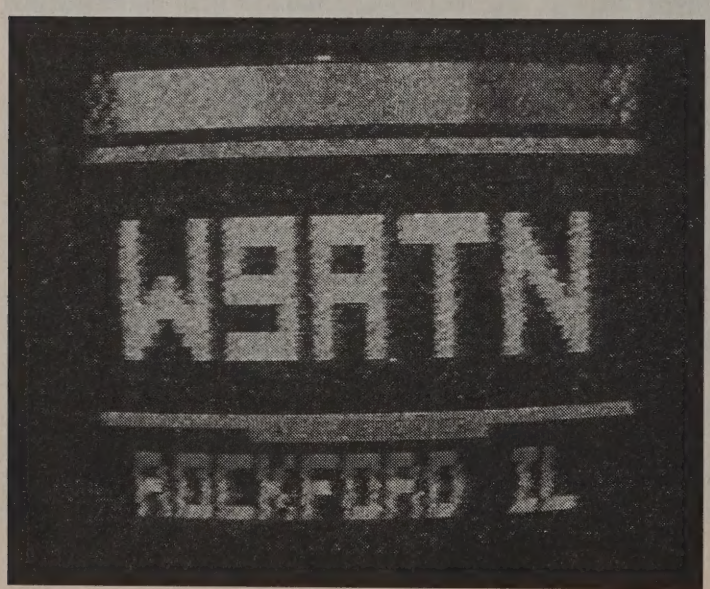
06/27/05
12:58 KC8LMI, Bryan, of Pleasant Lake, MI, reported working KC9IS and KB9ZAF in Racine, WI, a distance of 175 miles but no signal report info was available. Bryan also worked K8ATV that morning at 110 Miles.

07/02/05
Many S. Illinois stations reported up to P-1 video from a couple of the GPSL balloons. The ones that were making video were on 426.250 and were received here for about 30 minutes.

07/02/05 - 07/03/05
WU8O, Tom, of Plain City, OH, reported enjoying some very enhanced conditions across Ohio both nights of the July forth weekend. Tom reported seeing the Dayton repeater that usually just produces sync bars in at P-3 to P-4. He also saw the KA8MID repeater for the first time ever at P-3 approximately 60 miles away. Tom said he called CQ for hours in all directions to no avail.

07/09/05
11:00-12:00z K8ATV, Bob, of St. Joseph, MI, reported that he received the W9ATN repeater from Rockford, IL. He has seen it before but not this good. It was P-5 for about a half an hour before it started a 30 minute long descent into the noise.

Bob was unable to get into it or work anyone through it during the opening but did send along this screen shot taken from video tape of the event.



PLEASE SEND IN YOUR DX REPORTS!

Summary - DX'ing News

The ATV DX contest seems to be going pretty well and many have pledged to send in logs this year. Southern Illinois has been treated well in the last week with P-3 to P-4 pictures from Central IL every morning. Please consider sending in a log as well. If you need help with distance calculations/time conversions etc., don't hesitate to ask. I would be glad to help.

The big news of course is the new ATV Logger page at **DXworld.com**. This should be very helpful in coordinating a DX contact. This page will alert other DX operators of your presence so they will turn the beams in your direction.

Also since many of us do not use the Internet or have limited access to it, I would ask that you consider posting DX contacts for non-Internet capable stations when possible. Remember this page has no cookies or advertisements and is free of charge. It can give us great exposure to VHF and UHF operators that are only running ssb weak signal work. These operators know how to get the job done and already have beams and amplifiers for 70cm and above. All we need to do is plant a seed and maybe a new ATV operator will grow.

DX Tip: Temperature Inversions

Now that summer is here we have many more chances for ATV DX openings. One of the most intense and useful types of propagation we enjoy on ATV is the temperature inversion. A temperature inversion is simply warm air trapped below heavier colder air. Since the colder air sinks and hot air rises these inversions have a short life span and are often missed by ATV operators. Inversions form miniature ducts that can trap VHF and UHF signals keeping them from escaping into space and refract them back down well beyond the normal RF horizon. A slight temperature inversion is what takes place many mornings as the ground heats up with the morning sun after a cooler than normal night. That is why many of us have more luck working DX in the AM.

This also happens in the evening since the ground retains heat from the day and the air temp drops rapidly from sunset.

This helps to explain why it seems the second best time to work DX ATV is evening. The two examples above are often exploited by ATV operators but a much more intense temperature inversion can be caused by a summer thundershower. These temperature inversions are seldom caught by DX'ers because we simply are not on the air and looking for them. These openings are many times very intense and can produce P5's from stations you can't normally see above P-1 in the morning or evening inversions. The best ones are caused from a line of T-storms or even a duration event where a front causing storms extends for several hundred miles and holds together traveling several hundred miles.

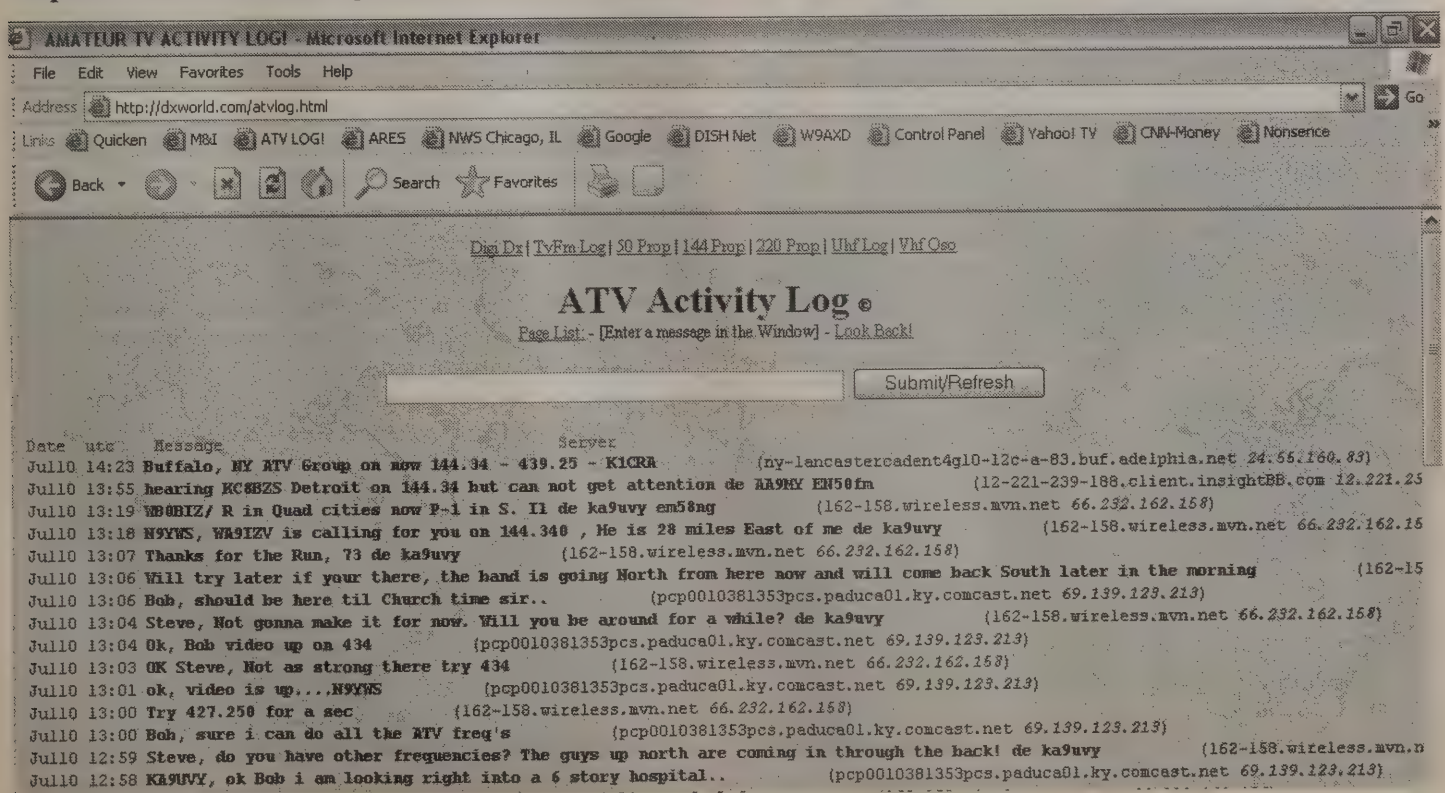
If a storm causes the temperature to drop15 to 20 degrees at your QTH you should experience an inversion. The time to get on the air is as soon as the danger from lightening subsides. The inversion should already be in progress in the direction the storm came from and that is the direction to work first since it doesn't last long. Try calling CQ first in the direction the storm came from and then 90 degrees either side.

Give it some time depending on known activity in that area and then follow the storm and use the same technique pointing at the back of the storm. Remember when you are behind the storm and following it you will have to wait for it to clear the next target location before anyone can get on the air or answer your CQ's. Break the habit of only operating mornings and evenings and be ready for the next storm to bring big signals along with the rain!

Important DX Info:

The Hepburn tropo forecast page has a new URL and is now at:
http://home.cogeco.ca/~dxinfo/tropo.html

If you are online you can post ATV CQ's and reports to the New ATV Logger page:
http://dxworld.com/atvlog.html


AMATEUR TV ACTIVITY LOG! - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Address http://dxworld.com/atvlog.html
Links Quicken M&I ATV LOG! ARES NWS Chicago, IL Google DISH Net W9AXD Control Panel Yahoo! TV CNN-Money Nonsence
Back Search Favorites
Digi Dx | TvFm Log | 50 Prop | 144 Prop | 220 Prop | Uhf Log | Vhf Qso
ATV Activity Log ©
Page List - [Enter a message in the Window] - Look Back!
Submit/Refresh
Date utc Message Server
Jul10 14:23 Buffalo, NY ATV Group on now 144.34 - 439.25 - K1CRA (ny-lancastercadent4g10-12c-a-83.buf.adelphia.net 24.55.160.83)
Jul10 13:55 hearing KC8BZS Detroit on 144.34 but can not get attention de AA9MY EN50fm (12-221-239-188.client.insightBB.com 12.221.23
Jul10 13:19 WB0BIZ/ R in Quad cities now P-1 in S. Il de ka9uvy em58ng (162-158.wireless.mvn.net 66.232.162.158)
Jul10 13:18 N9YWS, WA9IZV is calling for you on 144.340 , He is 28 miles East of me de ka9uvy (162-158.wireless.mvn.net 66.232.162.15
Jul10 13:07 Thanks for the Run, 73 de ka9uvy (162-158.wireless.mvn.net 66.232.162.158)
Jul10 13:06 Will try later if your there, the band is going North from here now and will come back South later in the morning (162-15
Jul10 13:06 Bob, should be here til Church time sir.. (pcp0010381353pcs.paducа01.ky.comcast.net 69.139.123.213)
Jul10 13:04 Steve, Not gonna make it for now. Will you be around for a while? de ka9uvy (162-158.wireless.mvn.net 66.232.162.158)
Jul10 13:04 Ok, Bob video up on 434 (pcp0010381353pcs.paducа01.ky.comcast.net 69.139.123.213)
Jul10 13:03 OK Steve, Not as strong there try 434 (162-158.wireless.mvn.net 66.232.162.158)
Jul10 13:01 ok, video is up...N9YWS (pcp0010381353pcs.paducа01.ky.comcast.net 69.139.123.213)
Jul10 13:00 Try 427.250 for a sec (162-158.wireless.mvn.net 66.232.162.158)
Jul10 13:00 Bob, sure i can do all the ATV freq's (pcp0010381353pcs.paducа01.ky.comcast.net 69.139.123.213)
Jul10 12:59 Steve, do you have other frequencies? The guys up north are coming in through the back! de ka9uvy (162-158.wireless.mvn.n
Jul10 12:58 KA9UVY, ok Bob i am looking right into a 6 story hospital.. (pcp0010381353pcs.paducа01.ky.comcast.net 69.139.123.213)

Interim Report On Modulating The Magnetron

By Heru Ra Walmsley, W3WVV
701 Wellham Ave.
Ferndale, Maryland 21061

Before you start working with this kind of power I want to remind you of safety concerns. These magnetrons are no battery operated QRP rig!!! The power supply will run up to over 4000 volts at greater than an ampere and getting across that could ruin your whole day!!! Remember, never work alone, have somebody with you who knows where the power off switch is and how to use the shorting stick and CPR. Also, always keep one hand in your pocket if the power is on. (If you are a girl wearing a dress without pockets, put a belt on and grab it with one hand in the back and hold on tight.) This is not something to take chances with. Also remember RF at these power levels and frequency can do equally bad things.

To modulate the microwave oven magnetron there is very little choice, modulate the magnetic field or the applied voltage.

If you try to put a coil around the magnetron and vary the current you will find from a very low frequency upward (around 4 or 5 hz), the shorted turn of the cooling fins and the magnetron body will effectively shield the innards of the device from the varying field.

If you measure the output power vs. anode current of one of these magnetrons you will find the power goes up linearly with current, across a wide part of the range (0.1 to 0.5 amps) and voltage can go down at part of the curve to get an increase in current. Most peculiar (see negative resistance sidebar), your power supply has to be able to handle a negative resistance load. The oven power supply handles this by putting a magnetic shunt in the power transformer so that overloads are not seen by the transformer primary. I took care of the problem by inserting a 105 ohm resistor in series with the magnetron. This has the advantage of being able to insert the modulation on a tap to the resistor, and thus I am able have both the power supply and the modulator see a positive resistance. I used 105 ohms because I had three 35 ohm carborundum low inductance high power resistors.

Before I could modulate the device I had to have some way of detecting the modulation. I have a Bird Termline power meter (250 mw F.S.).and it seemed like a good idea to switch the meter out and replace it with a resistor followed by an emitter follower. After doing this I found that I could not get video out of it. There must be a capacitor across the meter that was not visible. While I was looking to make a detector mount in a type "N" connector a friend furnished one for my use.

There are two ways to apply modulation to the device. Apply modulation to the cathode (filament) on top of the high voltage or insulate the body (anode) of the device from the mount and apply the modulation to the anode separately. I decided that the easiest thing for me to do was to add the modulation voltage to the DC tube voltage. To do this I needed a low output impedance device. I first tried to use a totem pole circuit using two transistors but I was never able to get this to work right. I was unable to find a PNP transistor to match the NPN transistor so I tried to use another NPN for the bottom transistor by feeding video to the base and tying the collector of the bottom one to the emitter of the top transistor. I couldn't get it to work satisfactorily so I went with a standard emitter follower.

Using this video modulator I found out that the power meter did not work as a video detector. I could detect a slight change in anode current when mining the video on and off so I knew something was happening. This was with the video fed in on the cathode resistor. At this point I decided to try feeding the modulation to the anode. Again I am using the video ID generator described in an earlier issue of ATVQ for a video source.

Insulating the body of the magnetron was not as difficult as I first thought. The big problem with applying video to the body is all of the capacity of the body to mount capacitor. If you just put a sheet of insulating material between the magnetron and the mount you wind up with something around .002 to .003 ufd. This kind of capacity is difficult to drive with video. A way to lower this capacity is to make a washer about 1/8 inch square in cross section and just slightly larger than the hole in the mount for the magnetron antenna. Use this between the magnetron and the mount with insulation on one side of the washer lowers the capacity considerably. Be sure to insulate the mounting bolts. There should not be much RF leakage because the slit is at 90 degrees to the polarization and is very thin. This would also make it possible to DC couple the video right to the anode of the magnetron. The voltage the insulation sees is relatively low (100 volts) so the break in the shield can be very thin. Applying the modulation this way also has the advantage of allowing DC coupling thus maintaining the DC restoration done in the low level stages of the amplifier.

Now for the big problem I have run into. The magnetron goes from no output to half a kw with very few volts change in anode voltage and guess where the remaining power supply ripple is! When I used the detector that worked I found a very large 120 Hz waveform coming out of the detector. This presents a real problem, how do you regulate a 4000 volt power supply to less than a volt of ripple? One of my friends suggested a varying load, a tube across the load with the input grid being fed the ripple from earlier in the filtering. This looks good in theory but

the HV is negative and tubes do not have a complimentary version like the NPN PNP transistor pair. So, what I plan to do is take a sample of the ripple from before the 105 ohm resistor and control the gain and phase before feeding it back in nearer to the load thereby hoping to cancel enough of the ripple to make it usable. This will take a 300 volt @ 3 amp + or - power supply, a tube amplifier, and a high power emitter follower.

My plans are to build this amplifier and use it to cancel out the ripple and feed the video in on the anode. For the power transformer I have several transformers out of defunct ovens, the primary of these should be adequate to handle the current and it should be fairly easy to rewind a secondary. For a tube I plan on a horizontal output from an old TV set. For the emitter follower I will try a 600 v, 500 A liquid cooled transistor from some electric car experiments (I have seen these for sale at hamfests). It does not have to pass video, just 120 Hz. I don't know of any tube that will work as a cathode follower and carry the current required. There may be better transistors for this purpose but I have this one.

A source of HV video transistors is the CRT grid drivers from defunct computer monitors. Non-working computer power supplies can supply the HV transistors for the regulated power supply required in the video amp. When I get the thing working I will include schematics and sources etc. in the article I write.

NEGATIVE RESISTANCE

I recently mentioned "negative resistance" to several people and got blank stares. Now I know that QST ran an April fool article called 'Negacycles" somewhere in the early forties, but negative resistance is real.

If I have a device that I can impress a voltage on and it allows current to flow, it is called a resistor (this assumes the current is not infinite). With current that increases as the voltage is raised it is by definition a positive resistor, BUT, if the current goes down as voltage goes up it is by definition a negative resistance device. Another way to look at is; by calling an increase in current or voltage positive and a decrease negative we define resistance, using Ohms law, as either positive or negative. When both have the same sign the resistance is positive, if the signs differ the resistance is negative.

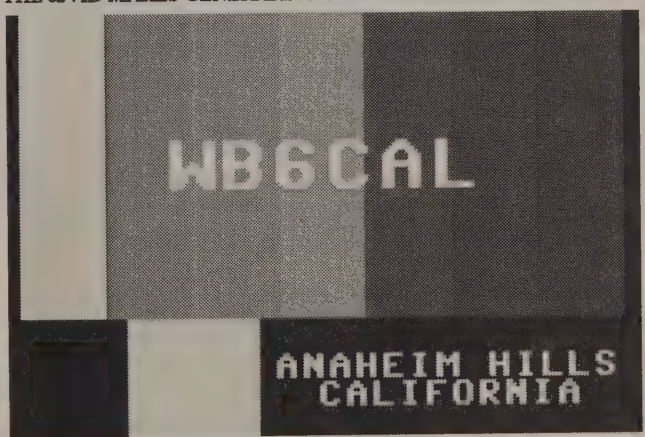
Before you scream it can't happen, let me give some examples of some devices where it does happen. Some diodes exhibit a kink in their voltage vs. current curve. Tetrode type tubes can be made to show this by operating the plate just above first crossover. As an oscillator this is called a "Dynatron Oscillator."

The term "first crossover" refers to the voltage at which the secondary electrons just equal the primary electrons. Electrons emitted by a cathode in a vacuum are attracted to a positively charged anode. As the voltage on the anode is made more positive with respect to the cathode the electrons hit the anode with greater and greater force. At some point they will hit with enough force to dislodge secondary electrons. When the number of secondary electrons equals the number of primary electrons the anode current will be zero. This assumes that the secondary electrons are collected on another electrode. As the anode is made more and more positive the number of secondaries increases making current go negative. At some point the energy in the electrons increases so that they penetrate deeply into the anode and generate the secondaries deep in the anode material. When this happens the secondaries cannot escape the anode and therefore current goes through zero again. This point of zero current is called "second crossover."

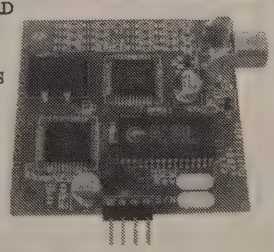
If you shock a tuned circuit it will ring and slowly die out. This is due to the positive resistance, now if you swamp out the positive resistance with a larger negative resistance it will ring with greater and greater amplitude until the amplitude is such that it drives the device providing the negative resistance into regions where it cannot produce negative resistance. In fact practically all oscillators that use a tuned circuit can be looked at as a negative resistance across the tuned circuit.

I don't know the mechanism that causes a magnetron to exhibit negative resistance, but I have measured this with microwave oven magnetrons. I have never seen radar magnetrons show this effect in over sixty years of experience with them, however I have to admit I wasn't looking for it. ATVQ

NEED AN ID SCREEN OR OTHER COLOR VIDEO IMAGE?
THE *ez*VID MAKES GENERATING COLOR VIDEO SIGNALS SIMPLE!



*ez*VID - THE SIMPLE TO USE SERIAL VIDEO CARD
- 9600 BAUD TTL LEVEL SERIAL INTERFACE
- SCREEN RESOLUTION OF 188 BY 254 TRUE BITMAP WITH NO CHARACTER CELLS SO CUSTOM CHARACTERS CAN BE COMBINED TO FORM GRAPHICS
- 14 DIFFERENT COLORS AVAILABLE
- 63 BUILT-IN STANDARD CHARACTERS
- 256 USER-DEFINABLE CHARACTERS
- STANDARD COMPOSITE NTSC NON-INTERLACED VIDEO OUPUT



LEARN MORE AT
WWW.MULTILABS.NET

ADDRESS:
1105 BELLECOUR WAY
LAKE FOREST, CA 92630
EMAIL:
SUPPORT@MULTILABS.NET
WEB:
WWW.MULTILABS.NET

MULTILABS

Science Projects For Kids

By Heru Ra Walmsley, W3WVV
701 Wellham Ave.
Ferndale, Maryland 21061

These are not directly related to radio but are interesting and can help spark a youngster's interest in science. Once they are intrigued by science it is easier to get them interested in amateur radio.

First, an easy to do experiment. If you have a Helium filled balloon in a car going around a curve which way will the balloon go? Will it go to the inside or the outside of the curve? If you try it you will find that the balloon goes to the inside. This is because air being heavier it has more inertia. The same idea as a block of wood floating in a bucket of water and being swung around in a circle. At the top of the swing the block of wood does not try to float to the bottom of the bucket.

Another interesting experiment with invisible gas is the overshoot carbon dioxide wheel. To do this make a wheel with buckets on the rim. Do this by cutting out a cardboard disk from a cereal box (use a compass to draw the circle so that you know the exact center). Make the disk as big as the box will allow. Now cut some about four inch circles from typing paper (or equal) and cut them in half like half-moons. You can now make cones by bringing the points on the ends of the diameter together to form the cone. Glue the cones around the circumference of the disk so that you have what looks like a water-wheel only out of paper. Now mount the wheel by a pin or needle through the center and stuck into an inverted "L" shaped piece of wood. Mount it on a suitable base. Make the wood "L" an appropriate size. The wheel must clear the bottom and side. It would also help to balance the wheel.

For the carbon dioxide, we will make it in a clear glass two quart pitcher. First put a level teaspoon of baking soda in the pitcher. Into a half cup of water add and mix in two level teaspoons of cream of tartar (tartaric acid). Pour the cream of tartar suspension on to the baking soda. This will produce lots of carbon dioxide. With a pitcher full of carbon dioxide you can carefully pour it on the side of the wheel that will allow the cups to catch it and you can watch the wheel turn.

Another interesting experiment with air is holding a ball suspended in midair. Get a vacuum cleaner that has a way to blow instead of suck out of the hose. Fix it so that the stream of air out of the hose is blowing straight up. Now get a plastic beach ball about a foot in diameter that you have to blow up by mouth (You want it heavy enough to fall to the floor if you let go of it but light enough to let the air hold it up). Inflate it and set it on the stream of air about a foot above the nozzle and it will sit there. This will also work with a ping pong ball on a small jet of water.

Some final comments:

Air may be invisible but it exists and can do things like support airplanes.

Acid mixed with sodium bicarbonate will yield carbon dioxide. The safest acid I could think of was tartaric acid. These are the active ingredients in baking powder. Old soda-acid fire extinguishers used sodium bicarbonate and sulfuric acid.

These experiments are interesting because you can not see what is causing the action and they illustrate some basic principles of physics.

Carbon dioxide is what makes baked goods fluffy. In some baked goods yeast is what produces the carbon dioxide. The trouble with this is yeast is a living organism and takes time to work, and it also produces alcohol. This is why you let bread rise, of course the yeast is killed and the alcohol vaporized out during baking. During WW II some bakeries put condensers on their oven vents to recover the alcohol for the war effort.

The air stream can be tilted a surprising amount before the ball falls off.

Figuring out why the ball stays on the air stream is an interesting exercise for the kids.

If you want to get fancy with the wheel make a cardboard trough leading the gas to the top of the wheel. Look at some pictures of water wheels that that have a chute to dump the water on the top of the wheel.

Have fun

More Science In Everyday Things To Interest Kids

Let us talk about circles and the relationship of the circumference to the diameter. This relationship is a constant called Pi (pronounced pie). The actual number is irrational the first six digits of which are 3.14159. For practical purposes it is used as 3.14. In any circle the diameter in any units, multiplied by Pi will give the circumference in the same units. This means that a circle Pi units around will have a diameter of one unit and it does not matter what the units are (they could be thousandths of an inch or miles, it makes no difference). All this is illustrated by the old saw about the circumference of the Earth. If the Earth was smooth and solid around the equator and there was a steel band just touching all the way around, and we cut the band and added six and a quarter inches, how far would it stand out from the Earth? Of course the answer is one inch. If you add two Pi inches to whatever the circumference of the Earth is in inches when you divide the total by Pi to get the diameter, it is two inches greater so the radius is one inch larger.

The above is interesting but cannot be tried and is interesting only as an exercise in logic. There are some real world uses for this logic, as in how a train goes around a curve and how the wheels center themselves on the track so that each wheel goes only the length of the track. First, why are the wheels fastened to the axle instead of allowed to rotate independently? This can be explained by levers and how force is multiplied or divided by lever arm ratios. While going around a curve the inertia of the mass of the train car makes it want to go off at a tangent to the curve. The flange on the wheels is what keeps it on the track. Now, with the mass of the car pushing against the flange at the bottom of the wheel there is a large twisting moment on the wheel. If the bearings were between the wheel and the axle, the load on the bearings would be many times the weight of the load and would cause them to fail faster than if they were moved out from the center of the wheel. Also if the bearing was at the center of the wheel and the bearing failed the wheel would be freed of its position on the axle and the train would immediately jump the track. By fastening the wheels to the axle the gage is maintained, even with a bad bearing. Second; how do the wheels compensate for different diameters. Since it is impossible to machine the wheels to the same diameter (even millionths of an inch difference could cause problems). If we look at a thousandth of an inch difference in diameter we find a difference of a little over three thousandths of an inch difference in circumference. This may not seem like much, but for a two foot diameter wheel going five hundred miles the larger wheel will want to go more than 100 feet more than the smaller one. This may not seem like much but with a fifty car freight train there are four wheels on each side of each car and this means that there are 200 wheels wanting to slide more than 100 feet each. Imagine how long the track would last with ten or more trains a day. If the wheels are made as sections of a cone, (thus tapering the radius of the rim the larger radius being next to the flange) with the point outside of the track on both sides there will be a place where both wheels are the same diameter. How do you get them to ride to that spot? It turns out that if you make the thickness of the slice of cone slightly thicker than the width of the rail and space them on the axle such that outside edge of one wheel is at the outside edge of the rail when the other flange is just touching the rail on the inside interesting things will happen. The wheel with the larger diameter will try to go further than the smaller wheel and twist the axel with relation to the track so that the axle will move across the track until both wheels have the same diameter on the track. Likewise, in going around a curve centrifugal force will cause the outside wheel to ride up on a larger diameter and the inner wheel to go to a smaller diameter thus compensating for the slightly longer distance the outer wheel has to travel (sneaky?). Because centrifugal force tends to make the train go off at a tangent to the curve you should never stand or walk on the outside of a curve in the railroad track when a train goes by. If it jumps the track it will go to the outside of the curve. If you are standing there when this happens the rescue workers will probably find most of your body parts to send to the morgue.

I am not going to even think about how the old steam engines managed with all of their drive wheels locked together but I will comment on something about the diesel-electric engines in use today. Railroads, in this country at least, are a for profit enterprise and the cost of operating is one factor in generating profit. The engines using oil for fuel had a choice of a mechanical or electrical connection between the engine and the drive wheels. The most efficient method is electrical. Years ago I was told by a mechanical engineer that in automobiles 75% of the power at the flywheel is lost between the flywheel arid the rubber-road interface (25% efficient). If you have ever tried to turn the input shaft of a manual automobile transmission by hand when it is sitting on the bench you could believe it! Under the proper conditions a generator on the flywheel with motors at the wheels can be 50 to 60% efficient thus using less fuel to do the same job.

Some final comments:

I know there are no experiments here but these explanations can take the place of "are we there yet" on a trip.

If you look around you, you will find many simple things are really an ingenious application of science and engineering.

Remember back when there were streetcars some of the turns were very sharp to stay in the street. When a streetcar went around them slowly there were loud screeches. This was because the difference in track length was more than the wheels could compensate for and one wheel on each axle had to slide make up the difference.

Another place where the difference in distance is compensated for is an oval race track. The runners are staggered at the start because the ones on the outside would have farther to go otherwise.

Another advantage electric drive has over mechanical drive in an automobile is that if a wheel spins as on ice or other slick surface the motor in that wheel takes less power, with mechanical drive the spinning wheel gets all the power.

In an automobile the driven wheels are allowed to rotate at different speeds while going around a curve or with different amounts of tire wear by the differential.

The non-driven wheels on an automobile (usually the front wheels) have the bearings in the hub but the weight is fairly well fixed so that strength needed can be arranged.

An interesting item about the old steam engines is that engines for pulling passenger trains had much larger diameter drive wheels than engines for freight trains. This was because passenger trains wanted speed and freight trains wanted the ability to pull a heavy load.

Curves in railroad track are usually banked so that trains can go around faster.

Why do you think they put transmission coolers on cars?

Have fun

I wish to thank K3OCO for reading the manuscript and offering constructive criticisms. W3WVV

ATVQ

More On Transmission Lines

By Heru Ra Walmsley, W3WVV
701 Wellham Ave.
Ferndale, Maryland 21061

You read that transmission lines must be properly matched or you will have standing waves but you can't see them. You can only see their effects on meters and other instruments. With this article I will try to give a visual demonstration (or at least a way for you to perform some experiments that will allow you to see with your own eyes the effects of mismatching power delivery systems).

Before we get into the nitty gritty of this there are several facts and formulas you should know. First, the maximum transfer of power from a source is when the internal impedance equals the load impedance. Since all generators of power can be looked at as a zero impedance generator in series with resistor and they cannot be separated. One way of determining the value of the internal resistor is to measure the open circuit voltage and measuring the short circuit current. Ohms law will then give the internal resistance. From this it can shown that the max usable power from the generator is when the load equals the source impedance. Second, E=MV squared over two. (I know, this looks suspiciously like Einstein's E=MC squared, and even the E and M stand for the same thing in both formulas, energy and mass. Maybe Einstein isn't as obtuse as he at first seemed.) Third; transmission lines have distributed inductance and capacity and the max frequency they will work at is where the dimensions become a significant fraction of a wavelength. Of course other loss factors limit their usefulness as you go up in frequency.

Now for the interesting stuff, for which you will need a window or bridge that you can dangle a 30 to 50 foot rope out or off of. If you jerk the top end of the rope to one side and right back you will have approximated a pulse introduced into an unterminated transmission line. You can watch the pulse go down the rope and hit the open end only to be reflected back. The pulse can also be seen to get smaller as it travels down the rope and back. This shows losses in the line. With luck you can also see a phase reversal in the pulse. Now find some way to fasten the bottom end of the rope down to something solid. You have just shorted the end of the line and now have a long transmission line shorted at the far end. The pulse will still go down the line and be reflected back. If you start putting mass on the end of the line instead of tying it down or leaving it open you will find that the reflections start getting smaller. When you get the right amount of mass on the end of the line there will be no reflections, you have matched the impedance of the line.

There are other places where you can find similar ideas. The springs on a car have shock absorbers to critically damp their movement to prevent the car from bouncing many times after receiving a shock from a road bump. Too much damping and the vibration will be transmitted to the frame of the car. Too little and the wheel will do a damped vibration through many cycles. The object is to get the energy from the bump to be dissipated in the shock absorber instead of the body of the car. To do this there has to be a match between the various units of the suspension (Impedance match if you will).

Another place to see these effects is with a bow and arrow. If we measure the "muzzle velocity" of an arrow as we change the weight of the arrow we will see some interesting effects. The velocity will be almost constant as we go from zero weight to some fairly heavy weight, and then starts going down. A good bow to try this out with is to use one of these pistol cross bows that are popular now. They can easily be mounted in a vise, and the bow can be repeatedly set to the same amount of pull. A nice way to see the effect of muzzle energy is to use a thick book of some kind as the target. I have used the telephone book on one occasion to get an idea of the energy in .22 ammo. It

was many years ago that I tried this but if memory serves me well a long rifle penetrated 1000 pages and a short penetrated 300 pages. In other words the .22 long rifle had three and one third times the energy of a .22 short. Anyhow, start with as light an arrow as you can and measure the speed right out of the bow. A soda straw might make a good bolt for a starting point. Then make it a little heavier and again measure and plot the speed. Keep on adding weight and plotting the speed until you have at least halved the speed (plot speed on the Y axis and weight on the X axis). Remember the formula energy equals mass times velocity squared over two. Plot on the same graph the energy in the bolt. You will find that the maximum energy in the projectile is when the velocity is reduced by one over the square root of two from the maximum velocity at zero weight. Again, at maximum energy in the projectile the same amount of energy is dissipated in the bow as heat. If you think bending does not generate heat try rapidly bending a piece of metal from a tin can back and forth for a few seconds.

There are many things in the mechanical world that depend on a match between the energy producer and the energy user. On a car the transmission matches the engine to the rubber-road interface, etc, etc, etc.

Some final comments:

The compound bow with the string making three passes is in reality an attempt to match the arrow weight to the energy in the bow.

If a source (battery or any generator) had zero internal resistance the short-circuit current would be infinity. If it had infinity resistance you would be unable get anything out. Since it must have a finite internal impedance because nothing is perfect, to get the most out you have to match that internal impedance.

Matching "impedance" for maximum transfer of power is found in many machines and places other than electronics.

Transmission lines or devices in the real world often require an impedance transforming device sometimes called an "antenna tuner" or "transmission" to do the best job.

Telephones used to have a matching coil in the box to match the 500 ohm carbon mike to the 2000 ohm twisted pair. (This was before they went electronic.)

I have seen and used 50 ohm, 62 ohm, 75 ohm, and 91 ohm coax. In fact 62 ohm makes a good quarter wave transition from 50 to 75 ohms.

I don't remember for certain whether it is the open or shorted line that inverts the phase. If you try the experiment with the rope it should quickly become apparent.

Have fun

ATVQ

W9DUA
Field Day with Amateur Television Activities.

PC Electronics PC70-20
Mirage D3010 45 to 50 watts with video
Zenith 9 inch color television
Homebrew FO 22 at about 35 feet
Yaesu FT 847 on 2 meters 5 element cushcraft at 35 feet

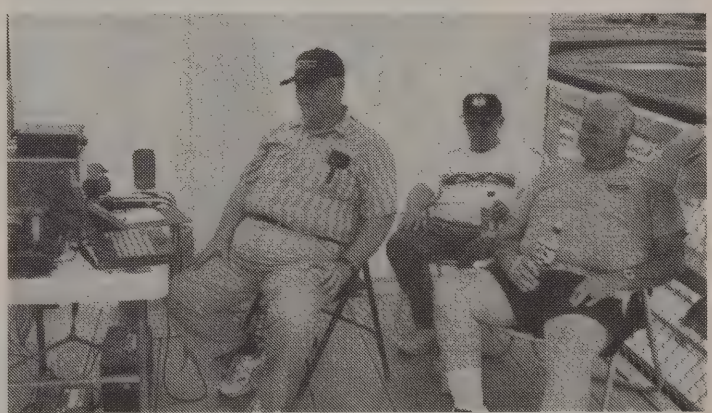
Worked the following stations:

06-26-05	0031	K9KKL	P5	P4	EM59ds	10.568 miles
06-26-05	1226	KB9WLM	P5	P2	EN40xn	55.570 miles
06-26-05	1237	KA9EGM	P3	P2	EM58km	94.685 miles
06-26-05	1248	KB9LII	P3	P1	EM58km	94.658 miles
06-26-05	1316	KA9UVY	P2	P2	EM58ng	114.954 Miles

First P unit received and second sent signal report. Photo is of station on top of bleacher at Riverton, IL. EM59fu.
Station operator N9XHU, Leonard.

Leonard, N9XHU

ATVQ



Leonard McWhorter, N9XHU, Jack Alspaug, N9UFO, and Ronald Brest, KC9HPA

20th Annual Banquet

The Central Illinois/St. Louis Area Amateur Television Club will hold their 20th annual banquet on Sunday, November 13, 2005 at the Ariston Restaurant in Litchfield, Illinois.

The banquet starts at 4PM with a get acquainted hour and dinner served at 5PM. Following the meal awards be presented including the club's annual ATV Operator of the Year plaque. A large prize drawing will follow.

There will be a small area for swap and sale items. For further information contact Scott Millick, K9SM, at 217 324-2412, smillick@wamusa.com or 222 N. Jackson St., Litchfield, Il 62056.

ATVQ

Great Plains Super Launch 2005

By Zack Clobes, W0ZC - Email: zclobes@swbell.net
1710 N. Admas
Hutchinson, KS 67502

The fifth annual Great Plains Super Launch is now officially over and most of its attendees are on the road this morning, returning home with all of their equipment.

The festivities began Friday morning at the University of Nebraska, Omaha, where Mark Conner, N9XTN, and the NSTAR balloon group, had arranged to have a lecture hall available for us. Introductions got started promptly at 8:30 am. Going around the room, approximately 16 groups were introduced, representing balloonists from Idaho to New York.

Friday Morning

Paul Verhage, KD4STH, kicked off the morning with a history of firsts in amateur ballooning, beginning with the first known amateur radio carrying balloon in 1967, flown in Europe. Bill Brown, WB8ELK, was the first known US amateur to fly a balloon in 1987. Paul is incorporating his history of ballooning into his book which is gradually being released in electronic form, chapter by chapter.

Paul's book can be found on the web at:
www.parallax.com/html_pages/resources/custapps/app_nearspace.asp.

Next Bill Brown, WB8ELK, showed off some of his toys, and how he uses them to assist in the tracking and recovery for the University of Alabama in Huntsville balloon flights. Wrapping up, Bill discussed a couple of his recent flights covering hundreds (and thousands) of miles of flight distance.

Ralph Wallio, W0RPK, built on Bill's introduction of long-duration flights using a spread sheet analysis. Ralph concluded that solar heating of an envelope at high altitude has a negligible affect on the lift that a balloon produces, at least a balloon that is only inflated to 50% of the surface area necessary to rupture the envelope, hereafter referred to as the Burst Surface Area or BSA. This is, at least in theory, due to the fact that the balloon has not stretched out enough at 50% of the BSA to become translucent.

Far more significant than the solar heating is helium escaping from the balloon over time. Based on a four day experiment, Ralph has measured the loss of helium from an envelope (filled to 50% BSA) at .15 kg per 24 hours. To counteract this loss of gas, he designed a ballast release mechanism, which would periodically lighten the load as the balloon's lift decreases

More of Ralph's research can be found at
users.crosspaths.net/~wallio/.

GPSL 2005 Group Photo

Friday Afternoon

Following the cafeteria-style lunch was Robert Rochte, KC8UCH, describing the solar powered balloons that he builds in his kitchen known as Tetroons. Robert described his research and building process using clear plastic painter's tarp, some finger paint, and a heat sealer.

Robert's first solar balloon took him four months to construct, and was spherical in shape. It successfully flew to over 50,000 feet, but cost him a lot of blood, sweat and tears. Further research turned up a tetrahedron shaped envelope, which significantly reduced his time-to-build from four months to about one evening.

Robert has found the most effective way to trap solar heating is not to use black polyethylene, but instead to use clear plastic .3 mil painters tarp and pour dry children's finger paint concentrate inside the balloon. The static charge of the plastic holds a thin coating of black "paint" to the tarp. Robert's research indicated that using a black coating on the inside of the bag provided the needed absorption, without re-radiating the balloon's heat back out into the atmosphere.

Using the above-described balloon, Robert has successfully flown multiple capsules to roughly 70k feet at a sluggish 500 foot per minute ascent rate. The balloons are roughly 35 feet tall when inflated, and are capable of lifting 1kg or about 2 pounds.

The afternoon was wrapped up by Jeff Dailey of Taylor University, and Jerry Stoner from Iowa State University. Jeff's group has developed a primary package that communicates with up to several experiment packages using a two-wire interface. The data is accumulated in the primary package's processor, and delivered back to earth via a 900 MHz spread spectrum radio at a rate of 100 kbaud, providing virtually real-time two-way communication with the payload.

Taylor has a rather impressive trailer that is used for tracking balloons. Inside the generator-powered station are multiple computers and radios. On top is a set of antennas commanded by an Az-El rotator that can track the balloon.

Jerry from Iowa State described several of their ongoing experiments including an altitude-hold "auto-pilot", a parafoil guidance system, and some prototype microgravity environments.

Their altitude-hold system is part of a larger floating RF platform that would be capable of suspending a package at one altitude for many hours or days. Many of the techniques that they have been developing were very similar to Ralph's discussion of dropping ballast from the capsule as helium (and therefore lift) is lost.

The parafoil experiments seemed to still be in their infancy, but Jerry had video footage of an R/C based steerable parachute that they had dropped from a tethered balloon about 60 feet in the air. Using a steerable parachute, they can pick a landing spot for the payload before it ever leaves the ground, significantly reducing the time and danger in recovering a payload.

Their final project consists of dropping a cone-shaped payload from a balloon near 100,000 feet. The cone is designed to drop straight downward at a rate breaking the sound barrier in an attempt to create microgravity. Apparently, NASA is interested in using the system to run various experiments at a cost signifi-

Habitat getting ready to fly

Jon Riley AJ0NR prepping Project Travelers capsules

cantly less than space flight or on the Vomit-Comet. The students hope to achieve up to 30 seconds of microgravity, if they are able to control a rocket motor in order to overcome the inherent drag.

Balloon Launch and Recovery

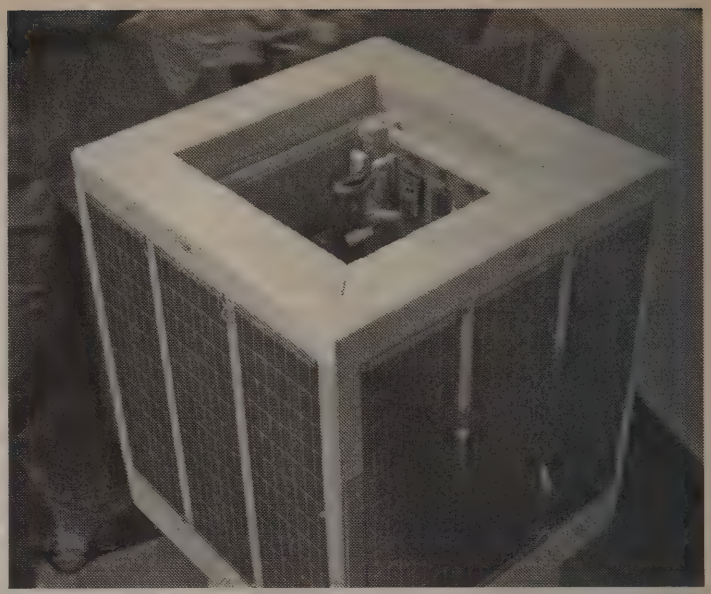
The actual launch was relatively uneventful. Unfortunately, the winds were beginning to pick up and many of the groups started to become anxious. By a little after 8:00 am, it appeared to become a free-for-all as balloons lifted off one-by-one.

All total, 10 balloons flew from the high school about 20 miles east of Omaha in Treynor, Iowa. Conditions were near perfect when groups started gathering at 7:00 am on a cool, mostly clear morning. Rain was in the area, but never moved in on us.

About 7:30 am, the first bottle of helium had been cracked, and filling began. Many of the groups sent ambassadors to scout out the situation of fellow balloonists. I must say that it was quite amazing to see the difference in payloads - everything from beautifully constructed Styrofoam structures, wrapped in mylar film, and color coded to Bill Brown's beautifully simple electrical tape and wad of bubble wrap.

Most of the balloons headed towards Grant, IA where they touched down. Project: Traveler had a problem with their cut down device, and barely made it outside of Treynor. Bill Brown had a problem with his load line, and consequently part of his payload did a free fall into a corn field, but were miraculously still working when they arrived on the scene.

Other than a few minor equipment glitches, all of the payloads were recovered in good time and were all intact.



Ralph Wallios solar powered capsule

Next Year

The Great Plains Super Launch 2006 will be held in Hutchinson, Kansas, but the date has yet to be set. Watch the **www.super-launch.org** website for details as the time draws close.

And next year, the only reason that the room may start spinning will have to do with how much helium you've been breathing in.

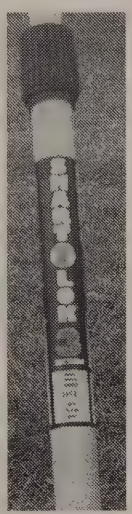
ATVQ

Zack Clobes filling Project Travelers balloon

Painter Pole Revisited

By Scott Montgomery - N9GLL
3424 N Nordica Ave
Chicago IL 60634-3635

When you need a quickly deployed mast for portable setups suitable for a small 440, 900 , or 1200 MHz beam or vertical mag mount antenna, the painters adjustable extension pole may be just the ticket . These poles are available in a number of lengths. When choosing keep in mind that longer ones will likely have more wiggle fully extended ,which is undesirable. In my case the one on sale at my semi-local home improvement center was a six to eighteen foot model that is small enough collapsed to fit in my van and sedan .



The SMART*LOK poles made by Mr. Longarm, Inc. have a feature that can be exploited to make set up quicker with different antennas in less time.

On the top of the pole is a socket for their "Quick - On / Quick-Off" adapters. Extra adapters (Cat Nr. 7702) are also available allowing for the creation of many antenna type specific pole attachments.

One such attachment was made by screwing a pole adapter into a three quarter inch I.D. by four inch long grey PVC close nipple. The open end then topped with a PVC pipe cap. It is shown in use with my PAR OA-432 Omni Angle antenna.

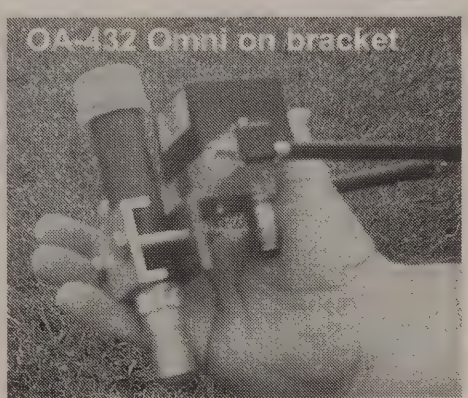
Another adapter was drilled it's length to pass a quarter twenty by two and three quarter inch round head bolt. The bolt was forced into the adapter so that its head was flush with the socket end of the adapter. With the addition of a nut this attachment has a number of possible uses alone.

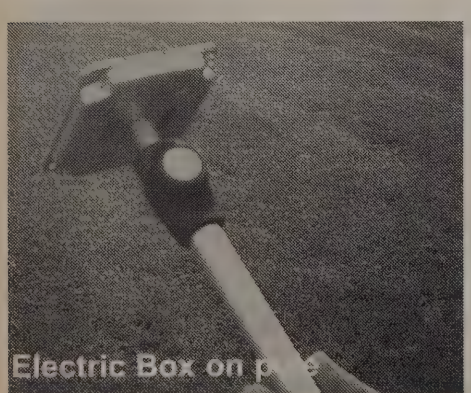
For magnet mount support the following would be attached to the just described adapter. A raised cover for two toggle switches meant for a four inch electrical box with a quarter inch clearance hole drilled in the center between the toggle handle slots is attached by two sets of number ten hardware to a blank equal sized box cover also having a quarter inch clearance hole in its center. When used for a magnet mount, a quarter wave length piece of wire would be attached and allowed to hang down to act as a counterpoise for the antenna.

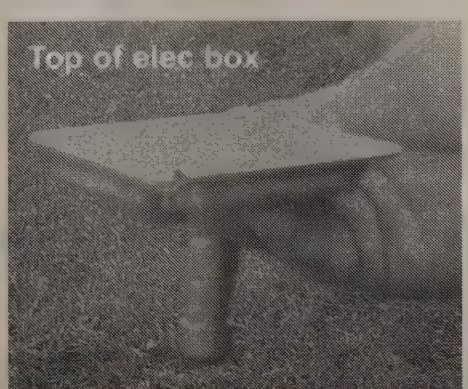
Having the clearance holes in the center of both box covers allows either to be attached to the pole adapter increasing the versatility of the attachment.

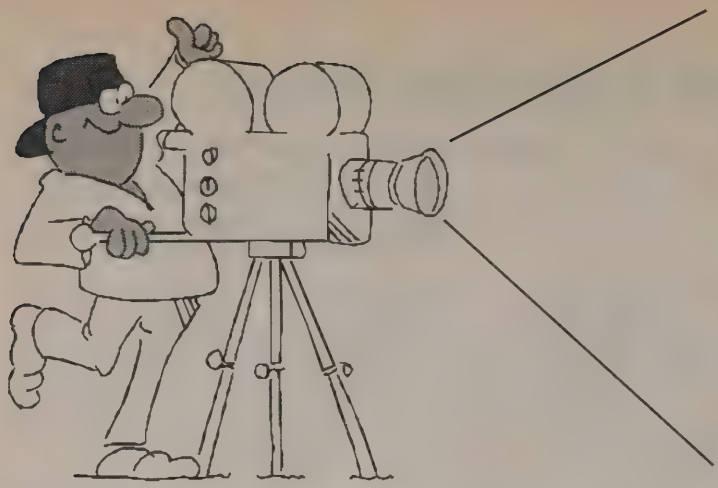
When not in use, the pole attachments are kept together in a zipper pouch of suitable size.

ATVQ









ADVERTISE IN ATVQ!

ATV'ers are hams that build projects more than other hams. They have a varied background ranging from technicial to engineer, and just might see a need for your product in their regular job as well as in their hobby. I hope to hear from you soon.

Please call TODAY!

Gene Harlan - WB9MMM - Editor/Publisher

ADVERTISING RATES AND DEADLINES

DEADLINES

COVER DATE	COPY DEADLINE	TO Printer	MAILING DATE
WINTER	January 1	January 15	Febuary 1
SPRING	April 1	April 15	May 1
SUMMER	July 1	July 15	August 1
FALL	October 1	October 15	November 1

While we will try to adhere as close as possible to the above dates, we reserve the right to adjust as needed.

If material is going to be late, please call to check if it will meet our schedule. We will try to accommodate everyone as best as we can.

Camera ready art or negative film right reading down are acceptable.

Trim Size: 8 1/2 x 10 7/8
Bleed Size: 1/8" beyond trim
Live matter: 1/4" within border

Harlan Technologies reserves the right to reject any advertising which is not in keeping with the publishers standards. Previous acceptance of any ad will not prevent Harlan Technologies from exercising the right to refuse the same advertisement in the future. Advertising orders are subject to the terms on the current rate card. Advertisers assume all responsibility and liability for any claims arising from advertisements and will protect the publisher from same.

Harlan Technologies will position ads in ATVQ at its discretion except in the case of preferred positions specifically covered by contract or agreement.

If, for any reason, the publisher fails to publish an advertisement, it will not be liable for any costs or damages, including direct or inconsequential damages.

Terms: All accounts not pre-paid are billed net 30 days. All accounts over 30 days are billed at 1 1/2% per month. Prompt payment is always appreciated.

RESERVE YOUR SPACE TODAY!
1-815-398-2683

AD RATES

Effective 1-1-2004

SIZE	INSERTIONS PER YEAR 1-3	4 up
FULL PG COLOR	$650	$500
FULL PG B&W (Covers II, III, IV $30 extra) (2nd color add $75 per page)	$160	$140
ADDITIONAL COLORS/PAGE	$100	$100
1/2 H or V	$110	$80
1/4	$85	$55
1/6	$55	$38

Multi-page ads are billed at the combined rate based on frequency.

Covers are reserved for COLOR ads.

All typesetting and layout charges for non camera ready ads will be added.

Amateur Television Quarterly

published by Harlan Technologies
5931 Alma Dr., Rockford, IL 61108
tel (815) 398-2683 fax (815) 398-2688
Internet: http://www.hampubs.com email: ATVQ@hampubs.com

Harlan Technologies

ATV Secrets VOL. 1. A 100 page beginners book, non technical, answers all those FAQ's. **$8.95**.....

ATV Secrets VOL. II. A 300 page technical compendium with everything you need to know about every aspect of ATV and UHF operation. Over 90 technical projects, plus theory and more. **$24.95**. ..... **On CD ONLY**

BOTH V1 & V2 on CD- $25.00 (Includes ATV Repeater Shipping **$6.00** (USA - Overseas more).....

IMPORTED BOOK:
The ATV Compendium from BATC. A great technical book applicable to UK and US systems ~~**$16.95**~~ **- Special $10**.....

NEW! "The Best Of Beasley - K6BJH - On Amateur Television" A collection of all the cartoons that have appeared in ATVQ over the years plus many more! Reg. ~~$8.95~~ SPECIAL Only **$5.00** (shipping $3 US - $6 Overseas) .....

Many issues of ATVQ are now available on CD ROM.
CD 1 contains 1988 & 89 (6 issues), CD 1 is $15.00 .....
CD 2 contains 1990 & 91 (8 issues), CD 2 is $15.00 .....
CD 3 contains 1992 & 93 (8 issues), CD 3 is $15.00 .....
CD 4 contains 1994 & 95 (8 issues), CD 4 is $15.00 .....
CD 5 contains 1996 & 97 (8 issues), CD 5 is $15.00 .....
CD 6 contains 1998 & 99 (8 issues), CD 6 is $15.00 .....
CD 7 contains 2000 & 01 (8 issues), CD 7 is $15.00 .....
CD 8 contains 2002 & 03 (8 issues), CD 8 is $15.00 .....NEW... .....
plus $5.00 shipping ($6 for two, $7 for three, $8 for four or more - Other than USA - higher)......
Complete set of all 8 ATVQ CD's - $90.00 plus $8.00 shipping (USA) .....

Previous ATVQ issues that are still available (most from 1994 to present) sell for **$4.95 each** (postage included for USA). Quantities are limited. Many good articles exist in these issues! .....
Color Test Chart including Color Bars, Resolution, Grey Scale, Registration **$5.00** (shipping $3) .....

SUBSCRIPTIONS :

VHF COMMUNICATIONS, a super quarterly publication from KM Publication in England - **$37.00** .....

Amateur Television Quarterly .....

RATE	USA	CANADA	DX
1 yr.	$20	$22	$29
2 yr.	$38	$42	$57
3 yr.	$55	$61	$84
4 yr.	$71	$80	$111
5 yr.	$87	$99	$136
LIFE	$399	$439	$579

PLEASE NOTE the EXPIRATION DATE on your mailing label. Please re-new early!

NAME:_____
STREET:_____
CITY:_____
STATE:_____ POSTAL CODE_____Country_____
PHONE:_____ HAM CALL_____
VISA/MC/AMEX # _____
EXPIRES:_____ SIGNATURE_____
E-MAIL ADDRESS _____
ARE YOU CURRENTLY ON ATV ? _____ YES _____ NO
ARE YOU CURRENTLY ON SSTV ? _____YES _____ NO
DO YOU USE AN ATV REPEATER ? _____ YES _____ NO
IF SO, CALL OF THE REPEATER _____ LOCATION _____
DOES THE REPEATER HAVE A WEB PAGE ? http:// _____

ATVQ, 5931 Alma Dr., Rockford, IL 61108
SUBSCRIPTIONS TO ATVQ 1-815-398-2683
FAX 815-398-2688 E-MAIL ATVQ@hampubs.com

Amateur Television Contest 2005

Contest period 00:00z 06/01/05 to 00:00z 09/01/05

Contest goal: To raise activity and promote *long haul* contacts on ATV. **This year encourage everyone you see to enter!**

Participants must hold at least a Technician class license and be within the boundaries of North America, Alaska or Hawaii.

In case of multiple Ham occupants, they may share equipment during the contest so long as the intent is not merely to manufacture points. All occupants who enter must submit their own log.

Schedules: The use of schedules is allowed, and can be made by any means available. The use of 144.340 mhz national ATV calling frequency is also allowed and encouraged.

REPEATER CONTACTS DO NOT COUNT. Distance calculations will be between both stations in the QSO with no relay allowed.

Exchange: Callsign with at least P-1 video on any amateur band 70cm and above.

MOBILE or **PORTABLE** stations must exchange their location at the time of contact as determined by portable GPS or other verifiable means.

VIEWER: Station does not have to exchange any video but must be a licensed amateur and confirm at least a P-1 reception report to the transmitting station via 2 meters or another amateur band.

CLASSES: There will be 4 classes for participants:

HOME: Primary location of residence with Fixed Antenna structure. Minimum distance for repeat contacts (75 Miles)

PORTABLE: Station can be set up just for the contest and may not operate from any other location during the contest period. Minimum distance for repeat contacts (50 Miles)

MOBILE: Station can operate stopped or while moving but all antennas must be affixed to the mobile unit and capable of transmit while in motion. Minimum distance for repeat contacts (25 Miles)

VIEWER: Station must be able to receive video at P-1 signal level and relay report to the transmitting station. Minimum distance for repeat contacts with this class is determined by the transmitting stations type or class.

Scoring System: Each valid contact will be awarded points for the mileage between the two stations on an ever-increasing difficulty per frequency basis as follows:

70cm = 2 points per mile

33cm = 4 points per mile

23cm = 6 points per mile

13cm and above gets 10 points per mile!

A station can be worked for points only once unless they are a minimum distance apart as specified by the class of entry. (See CLASSES) and then they may be worked once in a calendar month through the contest period.

The distance between stations will be calculated by the Maidenhead Grid and sub grid identifier coordinates listed on QRZ.com and rounded down to the nearest mile. Every effort should be made by entrants to verify or update their information before the contest starts. If you do not have Internet to look up a stations coordinates please ask the other station, if they do not know then leave the mileage column blank and it will be determined by the verifier. No changes can be made to coordinates once the contest starts unless you move.

Distance will be calculated with the (Bearing and Distance) DOS program by W9IP that is used by the ARRL for distance records.

LOG's: All logs must be in a standard format as specified below:

STATION WORKED RPT REC RPT SENT UTC DATE FREQUENCY GRID SQ DISTANCE POINTS

Your log information should also include your Name, Address, your Maidenhead Grid and sub grid identifier coordinates, and a list of equipment used. Sample Log is below and a full page Log sheets will be available on www.hampubs.com .

Logs can be submitted by email or regular mail and must be received by September 15th to be eligible for contest Awards. Send the logs to:

ATVQ Contest - 5931 Alma Dr. - Rockford, IL 61108 - or to: **ATVQ@hampubs.com**

AWARDS:

All Scores will be published in ATVQ and certificates will be awarded for the top three scores in each class. The highest overall score of the contest (The one who covers the most points on ATV) will receive the OVERALL WINNER PLAQUE

ATVQ

CALL			GRID SQ.			CLASS		
STATION WORKED	REPORT SENT	REPORT RECEIVED	UTC	DATE	FREQUENCY	Grid Sq.	MILES	POINTS
TOTAL MILES					TOTAL POINTS			
NUMBER OF DIFFERENT STATES WORKED								

Welcome To The Digital World III

By Henry Ruhwiedell - AA9XW - Email: a9xw@cs.com
5317 W. 133rd Street
Crown Point, IN 46307

Just because it is "digital" A: does not mean it is better, B: does not mean it is compatible, C: does not mean it has the same values. (Note, most numbers simplified to avoid math confusion)

All signal sources are not the same. Likewise not all displays are the same. Most programming we can watch on any channel, over-the-air (OTA) analog plain old TV (POTV) satellite, cable, DTV, started as an analog NTSC signal. Some new programming is produced in enhanced definition digital format (720) (Fox, ABC) or high definition format (1080I) (CBS, NBC, PBS).

Now consider this example: Take three US currency bills from your pocket, 1, 10, 100. They are the same size, the same shape, the same ink, the same paper. But the value is different because of the content (picture numbers etc). Likewise, all TV signals have different content values, degrees of detail, but must fit into the same size, shape, delivery system. By adjusting the value (1, 10, 100) we can fit more than one signal (bill) into our TV receiver account. At our bank, we can carry in 1's, 10's, 100's, or any combination of 1, 2, 5, 10, 20, 50 value bills that equal 100. In the TV receiver, the limit on the value number is 19.3 million. But no matter what we actually create, the TV is going to make the value equal to its display capability. What is called native format. A standard NTSC analog TV, or the standard definition digital signal is about 3.5 million. The TV set takes the 3.5 million and converts it to its native display, which may be 540 lines, 720 lines or 1080 lines high, and 350, 720, 1280 or 1780 pixels wide. A pixel is the smallest detail that can be displayed along one line. No matter what the line length is. Just as an analog TV set displays 480 lines, no matter if it is a 5" or 35" screen.

The digital transmission format allows the 19.3 million to be divided into "folders." Each represents video, audio or data. The source decides how much value to put into each folder, and if the total is less than 19.3 million, the balance is just null packets to fill up the empty space. The TV receiver decodes the 19.3 million back into individual files, and displays what channels (folders) are available. It takes a minimum of 8 million for 720 and 11million for HD, and 3 million for SD. All this is done in IC chips, and is automatic. The TV set, then converts the channel content into its display capability. Every input is converted, broadcast, direct video input, to the same display values. When looking at TV displays at the store, check the actual digital values. Most are ED displays (720 x 1280) and only a few are true HD 1080 x 1780.

At the transmission end, all signals are converted to one format. It is not possible yet to directly mix different "values" SD, ED, HD because the home TV set would go nuts, every time it changed. The process, called MPEG 2 is an electronic math that takes the analog or digital signals and make it into a uniform digital stream. In order to make large values small, it leaves out data that can be recreated at the other end. The process uses a GOP or group of pictures. It can send on every picture (BBBBBBBBB) or every other picture (BPBPBPBPBPBP) or leave out several pictures at a time (BIIIIIIPIIIIIBIIIIIP). The output is a constant value, mathematically derived by the amount of data reduction required to fit the 1, 10, 100 into the 3, 8, 11 pipe.

To confuse matter more, there are several versions of MPEG, (low, main, high) and MPEG 1, MPEG 2 and MPEG 4. None are compatible with the others. There is also at least 4 sampling rates, 4,4,4, 4,2,2, 4,2,0, 4,0,0 which are the sample rates of the luminance, and the two chrominance channels. Again, none are compatible with each other.

There are also several transport stream formats: Composite, component analog, composite digital, component digital, and RGB. Composite means the signals are all mixed into one, similar to regular analog. Component means each set of data is sent in clusters in a serial form, using one of the MPEG sample rates just above (4,4,4, 4,2,0 etc). RGB is a parallel (three wires) system where red, green blue are sent simultaneously, along with sync (a 4th wire). The form is chosen based on the bandwidth (value) of the original signal. For highest quality 4,4,4 format is used but requires up to 3 Gigahertz of bandwidth.

SDI serial digital requires 1.3 Gig for HD and 750 meg for SD. At the digital encoders, all of these must be reduced to fit into the 19.3 meg pipe to the home TV. Data is also included that tells the TV set how to decode the signals, what the original format was, and the TV set uses that data to convert the signal into the native display it can produce.

Audio can also be in various forms, mono, stereo, AC-3 Dolby, Dolby E, and Dolby 5.1 surround sound. Obviously the ability to recreate the sound in the home depends on what was captured at the source. Synthesizers can create phase differences to create a pre-selected pattern to make faux stereo, or surround, or if enough information is sent out, represent the true sound at the program source. However, it takes 6 channels of source audio to produce 5.1 surround sound, and few systems can record and play 6 channels. So it is usually encoded into AC-3 or Dolby E, to provide 3 channels of sound (L, C, R). Many stereo systems and some TV sets have selections for audio to create different home sound environments from 2 to 6 channels.

Program sources can change the format themselves, thus controlling the output product, but paying for the costs of conversion or let the TV set do it for them at no cost.

Most choose to pass legacy programming (4:3 format NTSC) through an expensive standards converter to create ED or HD, change aspect ratio, and remix the original audio. Film is universally convertible since the format is usually 16, or 35 mm, and the camera/scanner can be of any format. Film audio is also always recorded in three stereo tracks, (6 channels) dialog, music and effects. This allows foreign language to be substituted without having to remix audio and effects. With THX SDDS, Dolby Digital and other surround audio systems, the stereo pair for the three channels, can actually be 6, 7 or 8 channels each (24 channels total). All of which must be mixed to mono for the home TV, plus stereo for the home TV, and now 5.1 for HD surround. All the more reason to make sure recordings and play outs have the correct level, balance and phase.

The most historic goof was when NBC debuted stereo on Miami Vice in 1987. The stations had all built stereo facilities (TV was mono before this). At the precise moment after the intro, the announcement came on screen "NOW IN STEREO." But the program mix was out of phase and gun shots sounded like pillow impacts on pillows, and some dialog was completely silent in mono because it was out of phase. Monitoring must be done in mono and stereo, and usually on an audio phase display either showing the traditional X-Y form (tilted or not) or positional display (circular space). ATVQ

Coax Questions

Dear ATVQ,

I wish you would ask Henry (as a follow up on his article on coax), when I went through the Navy E.T. School in WW II, we were taught that coax impedance was not frequency sensitive. An ohmmeter would show the cable impedance on an infinitely long lossless cable. If we had a lossless 50 ohm cable from the earth to the moon, and hooked a Simpson 260 across the cable, it would read 50 ohms for about four seconds. Now, you can not get much lower in frequency. It also seems to me that Time Domain Reflectometry would not work if coax was frequency sensitive.

Heru Ra Walmsley, W3WVV

Coax tested with an ohm meter will register open or shorted, and if shorted, the ohmic loss of the wire between the meter leads. A TDR tests coax by using a high rise time pulse, which is made up of all the odd and even harmonics of every frequency limited by the initial rise time. The pulse appears as a complex AC signal and Fourier analysis can determine the actual frequencies present. The pulse sharp rise time is reflected back to the generator and detected in the time domain. Thus time domain reflectometer. The shorter the time, the closer the impedance bump (open, short or otherwise) is to the source. TDR's measure the time and amplitude of the reflection to measure the amount of impedance variation and its location. In the old days we did this with a square wave generator and scope, and would trigger the scope sweep with the leading edge of the square wave, and look for reflections following. Sort of a Ghost Buster.

The DC resistance has little to do with the cable AC impedance other than you can sub Z for R in Ohm's law. The DC resistance is purely a function of the resistance of the cable (copper tube, whatever) and is a linear function, usually noted in ohms per 100 meters or some other convenient form. Impedance is a function of capacitance, coupling between conductors, the dielectric constant, and the inductance. The AC resistance is dependent upon frequency since the skin effect varies the amount of conductor actually carrying the AC current. At common RF frequencies in ham radio, skin resistance is dependent upon the conductivity of the very outer most atoms of the conductor. The majority of the mass of the inner conductor carries no current and is little more than a heat sink and physical support. The larger the conductor is the more surface area and thus the higher the power rating and lower loss. Skin effect is so dramatic, that if we simply use a short stub we need no wire in the center at all, thus waveguide with in and out coupling. All coax has loss, even waveguide or the reverse, we can eliminate the outer conductor and the center wire becomes a guide line with conical catcher and launcher at each end.

At very low frequencies (think AC mains) the wires are less than a wavelength long. If the cable is less than a wavelength, then the AC impedance is replaced by the surge impedance. Think about the 'Thunk" when you turn on a heavy load and the current rushes through a near zero impedance to the load. Until the load stabilizes the inrush of current, you have semi infinite current, a near zero impedance, thus a blown fuse, bulb etc, if the device ratings are exceeded. Imagine this on a 760KV distribution system cable! At DC, from an ohm meter, practical length cables are too short to measure the surge impedance, but if the resistance were low enough, you might be able to detect the return pulse from when the voltage of the ohm meter was applied.

We can do this on purpose to increase a source voltage by quickly shorting then un-shorting a line; resulting in voltage spikes many times the source voltage. This is why a damping diode is often placed over a coil, to prevent the over voltage spike, or useful in a DC to DC voltage up converter with no transformer needed. More information is available in Bill Orr's Radio Engineering Handbook, the ARRL Antenna Handbook, and many other publications.

Henry, AA9XW ATVQ

Welcome To The Digital World IV

By Henry Ruhwiedell - AA9XW - Email: a9xw@cs.com
5317 W. 133rd Street
Crown Point, IN 46307

Can you hide a second TV Signal in an analog TV signal?

If we look at the structure of a standard NTSC TV signal, we find several discrete components. We call these sub carriers. There is one for sound, another for stereo, another for SAP and yet another for PRO channel audio, and of course, two for color. Two? Yep, the color signal is composed of two carriers at 90 degrees, called I for in phase, and Q for quadrature phase. All of these live happily as long as the amplifier is linear and we have minimum cross modulation or IM. But as crowded as this seems, there is room for more!

If we look back before the grand alliance, there were efforts to make ANALOG high definition TV. A system adopted by the Japanese used analog signals and several proposals using analog signals were proposed for the US HDTV service, but late in the process General Instrument suggested using a digital transmission format, similar to the MPEG format used by digital satellite signals, best known as Digicipher, and Digicipher II as subscription/scrambled signals. Today those can be decoded by a standard MPEG receiver, so more sophisticated encoding is required. The result was ATSC (Advanced Television Systems Committee) abandoned the analog solutions and jumped on the digital bandwagon (called the Grand Alliance) and developed the 8VSB signal used in the US today. (DVB format is used in Europe).

But the analog TV signal has lots of available spectrum holes. Just as it is possible to have two color sub carriers on the same frequency (3.579545 MHz) We can also transmit a second non interfering signal on the primary video carrier, say 439.25 MHz, by sending it in orthogonal phase. If the phase relationship remains a constant 90 degrees, the 2nd signal is completely invisible in the main NTSC signal, with some limitations.

We can't extend the second video information into the region of the color or sound sub carriers, because the sound and color carriers are not phase stable, and are not phase coherent with the video. Color is off-set by 1/2 the horizontal rate, so the sidebands fall in between the video sidebands, it is also phase shifted because the two sub carriers, I and Q are rotated 45 degrees. The sound is FM; therefore it is almost never in phase with the video. But we can get clever.

We can reduce the bandwidth of the 2nd signal similarly to the way heterodyne color video recorders do, by shifting the color carrier to 688 KHz, or some other frequency, but we have the phase coherence problem with an FM signal. We can slip the 2nd video sidebands in between the first video sidebands, just as we do the color signals, and limit the upper frequency with a brick wall filter. So half way there. (For a full explanation of the RF spectrum of a TV signal and interleaving of the sidebands, see ATV Secrets Vol. II)

But what about a digital signal? The data rate for an NTSC equivalent in MPEG II is about 3 Mbps. Satellite and cable systems frequently reduce this to as little a 1 Mbps. So if we lower the data rate, we can fit the digital spectrum in the space below the color pass band (3.58 +- .5/1.5 Meg). We can use several data modulation systems including versions of QAM. (Quadrature amplitude modulation) depending on the data rate we want to transfer, and to some degree, the relative coverage area we want. As long as we choose a symbol rate that provides a spectrum that is offset from the primary video to fit the sidebands in between each other, we got it made, almost.

If we try and generate the two signals in one exciter, we have a host of problems because the video is a constantly variable RF power level and the digital is a constant power level. Analog is an AM signal. During sync, it is at 100% power, black, about 2 db lower, and during white, 12% power. We have to amplitude modulate the digital signal, so the ratio of the digital to analog signals are the same, otherwise, the digital signal would be stronger than the analog signal. So we can't really use the amplitude function of QAM. Again, we can be clever. If we use a sample of the main video, we can amplitude modulate the digital amplitude, to keep a constant ratio. Now the signals are compatible, since the transmitter is not going to be putting out a carrier modulated by the digital amplitude, which would in itself modulate the original video since the TV receiver is a simple voltage detector.

Imagine if you will, trying to detect an RF envelope that represents the original analog video, with some hundreds of digital pulses riding at a constant level, the screen would be filled with "static" like black hole noise that would vary with the strength of the analog video! Not pretty!

By having the amplitude of the digital signal be controlled by the analog signal, we can choose a C/N ratio (carrier to noise) and keep it constant. In the digital receiver, we can use the inverse of the analog video to restore the digital to a constant level. We know from tests and observational experiments that there is a threshold of visibility for noise in video. I.E. the difference between a P5 and a P4 picture. If the noise level is constant, similar to the noise in a VHS video, we TV watchers will tolerate a C/N ratio or noise floor about 40-45 db. If the noise is less than that (say 46 db or higher C/N ratio) we may notice

some noise but it won't bother us, and with numbers above 50 db few see any noise. Remember db is logarithmic, so 10 db is a significant difference.

Now we can mix the digital signal with the analog signal, and it will be invisible to the analog NTSC viewer, because it is below the threshold of visibility. Now there is a trade off. While digital receivers can detect the digital signal at a lower C/N ratio than the analog (envelope) receiver can, there is a "gain" in how low the digital signal strength can be. Just as a 300 KW DTV signal is about equal to the 5 MW analog TV signal, because the DTV signal receiver only needs a 15-16 C/N ratio, while the analog TV needs 40+ db C/N ratios. So being 50 dBk (below carrier) is not all that bad. Consider that the analog video only has a modulation depth of 26 db; there is lots of analog power even during the lowest power white video. The next advantage is that a 50dBc signal is using less than 1% of the transmitter power, so only an insignificant power increase. In practical application, the hidden digital signal is able to be received to about the A contour of the analog signal.

If we try to mix the two signals in one exciter, we cannot correct for the constant non linearity caused by the amplifier chain and VSWR variances between stages. We can, however, correct for these if we use one RF feedback correction loop for the analog exciter, and a second RF feedback correction loop for the digital signal. Since modern transmitters all use a low power exciter and one or more power amplifier in parallel, there is only one common stage of amplification. Therefore we want to mix the signals at the RF level rather than base band, or IF (45 MHz) level so we only have one active device to correct for. We adjust the injection level of the digital signal to achieve the analog to digital carrier ratio desired, and it just becomes another sub carrier. The digital RF loop would provide information to the digital exciter to correct on an instant by instant basis, likewise the analog. And going back to the start of the process, a sample of the video base band signal, can be used to correct the phase and amplitude relationships, to maintain constant phase and amplitude ratio. Taa daa, we have done it. We have hidden a complete second TV signal in the standard analog TV signal, consumed no additional bandwidth, and because the modulation is completely different, neither is visible in the other's receiver. Here's the secret. Your local PBS TV station may already be providing this, soon most will!

ATVQ

Multilabs Announces the Release of the ezKEY Keyboard Adapter

The ezKEY is a simple to use adapter that allows you to use any PS/2 compatible computer keyboard with a microcontroller, stamp module, or other embedded device. Access to the connected keyboard is through a standard 2 wire 9600 baud TTL level serial interface. This allows the end-use application to talk to the keyboard without any knowledge of the PS/2 protocol, keyboard scan codes, or PS/2 command set. The ezKEY takes all the scan codes and turns them into simple to use single byte ASCII codes relieving processor strain from the end-use controller.

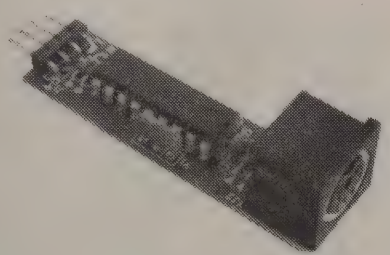
The simple to use ezKEY commands allow the application to initialize the connected keyboard and review keystrokes. The ezKEY even comes with a 40 character buffer to help store keystrokes between readings. The ezKEY automatically controls the status of the num lock, caps lock, and scroll lock LEDs and monitors the states of the shift keys. This allows the ezKEY to report the correct ASCII code without the end-use application having to monitor status and make any necessary changes such as whether to use lower-case or upper-case.

The ezKEY comes in a simple to use SIP module that measures only 2.1 by 0.551 inches. A 4-pin header is provided to supply power to the adapter and access the serial data lines. The ezKEY is also provided with a standard PS/2 receptacle to plug your keyboard into.

With the addition of the ezKEY, Multilabs has created a complete user interface solution for microcontroller systems. The ezVID series of video modules, ezMOUSE mouse adapter, and the ezKEY can all be used together to create a complete user input/output solution.

You can view more information about the ezKEY and the rest of our product line at **www.multilabs.net**.

ATVQ



Radar on 434 MHz

WJ9H/ATV is back on the air Saturday morning in time for Field Day with weather radar. I found an intermittent component on the exciter's circuit board. (Although I don't know exactly which one yet...)

Did you know that a lot of car lock remote controls operate on 433.98 MHz? I'm finding that some employees and visitors to WMTV (where WJ9H-TV transmits from) can't get their remotes to work while 434 MHz ATV is on the air. Part 97 trumps Part 15, but it doesn't make a lot of people happy. Harrumph.

--Tom Weeden - WJ9H - Madison, WI - tcweeden@tds.net
www.qsl.net/wj9h

ATVQ

DBs For The Math Challenged

By Henry Ruhwiedell - AA9XW - Email: a9xw@cs.com
5317 W. 133rd Street
Crown Point, IN 46307

It all started with a bell, Alexander Graham Bell to be precise. Old Alex was as you may know, interested in helping the deaf, thus his interest in audio and the telephone. What you may not know, is that the system we use to measure most anything, named after his Royal earness is easier to understand than chicken soup.

Let's dispense with the boring history, and just express that the Bell, a unit of measurement, and its derivatives, the decibel (dB) are a way of expressing ratios. The Bell or decibel is a log function, meaning that it is really an exponent, not a numerical value. Don't run away yet, it is truly easy. Experiments in audio set two functions, one was to relate the power of an audio signal to what we perceive as twice as loud or half as loud. The second parameter is what the smallest change our ears can detect is. After thousands of tests, an average was found for each.

Now eyes and ears are logarithmic responsive, not linear responsive. That means, if we double the amount of light or the level of sound, our eyes and ears do not see or hear something twice as loud or twice as bright. A 200 watt light does not look twice as bright as a 100 watt light, and a 50 watt does not look half as bright as a 100 watt. In audio, most sound sources (loudspeakers for example) are usually referenced to 1 watt of audio power. Making the signal 2 watts or a half watt does not make it twice as loud or half as loud. It actually takes a change of 10 times to equal "twice" or "half."

Now if we get into long numbers, say 3580 watts vs. 2750 watts, and try and figure out the loudness difference, or our RF power range difference, it's not so easy. And in calculating system gains and losses, we can mess up adding 33 watts of power loss, 62 watts of transmitter power, 14 watts of connector losses, 99.99% path loss, antenna gain of 22, preamp noise floor of 24 degrees, and other factors. But if we convert these to db, it becomes real easy to figure out how many microwatts or milliwatts are at the receiver.

First, a dB is a decibel, a tenth of a Bell. The Bell is equal to what our eyes and ears perceive as double the power (loudness, brightness etc). Or conversely, half of the power. The decibel is the smallest change in power that an average person can detect.

Here is a simple scale

1=0
10=1
100=2
1000=3
10000=4
100,000=5

The number to the right of the equal sign is the log of the number. It works the same for numbers less than 1 equally except the number becomes negative. We say this is a base 10 or log 10 of a number. You can think of it as the number of zeros after the 1.

Now back to our loudness ratios. dB are added which makes it real simple to figure ratios. If I have a +30 dBm signal, and a 10 db antenna gain, I have a +40 dBm signal. In this case, milliwatt is what the small m means relative to 1 milliwatt. I can also have a K meaning relative to 1 kilowatt. You can use any of the metric labels. Now a +30dBk signal is 1 million watts. 30 dB above 1000 watts. Adding 3 zeros to 1,000 = 1,000,000. If the signal was +20 dBk, then add 2 zeros for 100,000 watts.

dBm = power relative to a milliwatt
dBW = power relative to a Watt
dBK = power relative to a kilowatt.

Notice there is no other information, no impedance, no voltage, no current mentioned. dB is always a ratio of POWER, nothing else.

Now we can figure out dB's very easily. How much is +6 dBW? 1 dBW would be 1 watt. We know 10 db would be 10 watts. Keep in mind that 3 dB is half or double the power. So +3 DB would be 2 watts (1+1) and another 3 db is double again (2 watts + 2 watts) = 4 watts. If we went to +9 db, we would double the power again to 8 watts. Now we know from this example that another 1 db would be 10 watts (+10 dBW) so a dB is about 20% difference.

We can go the other way just as easily. If we had 10 watts, or 10 dBW, and lost half of that power in the coax, we know we have 5 watts left. In dB, we know that half power is -3dB. So 5 watts = +7dBw, 7 dB over 1 watt. In dBK, +37 dBk is 5 million watts, the maximum a UHF station can have for an ERP. +34dBK would be 2.5 million watts, and while that seems like a lot less than (to be precise 2.5 million watts less) 5 million watts, it is 3 db less, and in real life, that means about 3 miles difference in distance.

Practice, convert the following to dB.
16 watts
3 watts
160 watts
300 watts
300,000 watts.

For 16 watts we can do the math two ways. 10 +3 + 3 or 20-4.

We know 10 watts is +10 dBw. 20 Watts would be 3 dB more, and 1 dB is about 20%, so 16 is going to be about +4 dB. So we have +14dBw. Now if we look at 160 watts, it is only 10 dB more than 16 watts, so +24dBw.

3 watts is about the same method. We know 2 watts is 3 dB more than 1 watt, and we are another watt. So 0 dBw, + 3 dB = +3 dBw, (2 watts) We know that 4 watts would be another 3 dB, or +6 dBw, so 3 watt sis going to be about +5 dBw.

Going to 300 watts we just add 20 db, for 25 dbw, or 300,000 watts we add 50 db or 55 dBw. We can also convert it to dbk, as 300,000 is 300kw, so subtract 30 db from +55 and we have +25 dbk. 1 kw = 0 dbk, 10 kw = 10dbk, 100kw = 20 dbk, 200 kw = 23 dbk, and the added 100,000 is another 2 db (rounded) for 25 dbk.

Note that db is a ratio and can be positive or negative. If we had 100 watts, that would be .1dbk (1/10th of a kw), or we could say -10dbk. Meaning 10 db below 1 kw.

ATVQ

New Accessories From MFJ!

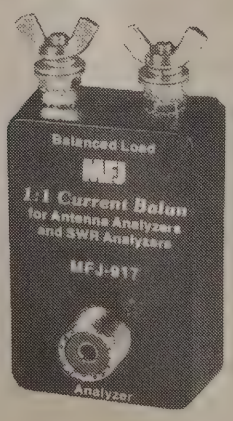
Clamp-On RF Current Meter

MFJ-853, $39.95.

Calibrated clamp-on RF current meter accurately measures RF current in antenna elements, ground wires, and coax shields. MFJ-853 simply slips over mobile whip to tune for maximum current/radiation. Has 0.3, 1, and 3 Amp ranges. Non-metallic case minimizes field disturbance for accurate reading. Tiny 21/4Wx33/4x1D inches.

SWR Analyzer Current Balun

MFJ-917, $19.95.



1:1 Current balun lets you use your SWR and Antenna Analyzers on balanced line antennas and other loads. Covers 1.8-30 MHz. Perfect accessory for MFJ-249B/259B/269, etc.

ATVQ

ATVQ Appreciation

I particularly enjoyed the D-ATV articles and the GB3HV ATV streaming article.

Having been active on the Portland ATV repeater **www.oregonatv.org** for the last 15 years, my personal interests are in the areas of D-ATV and internet IRLP style of video repeater linking. With fiberoptics to the door, this is the future of amateur television, linking small pockets ATVers to something greater.

No response necessary, just some "Q" reader feedback.

Enjoy the magazine a great deal.

Dennis, WA7DRO - belles73@comcast.net

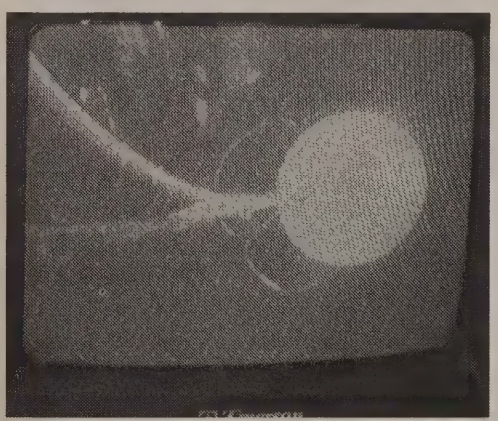
[Editor] Thanks Dennis!

More GPSL

I just put some photos received from the balloons at GPSL 2005 on 426.25 up on my website: **http://www.wb8elk.com**

AE0SS balloon shows the balloon and my photo shows my telemetry. We shared the same channel. EOSS transmitted every EVEN minute and I transmitted every ODD minute. It worked great with only a few seconds of overlap at the end. KA9UVY and several others in the Mt. Vernon, IL area viewed the signal from about 390 miles away.

73s de Bill, WB8ELK



AE0SS ATV on 426.25 MHz (shared channel - transmitted every even minute)

Children of the Corn (l to r: Mark, KA9SZX, Paul, KD4STH, and Jim, KC0SHZ)

Get A Grip On Clamps, Bias And AC-Coupled Video Signals

By Dallas-Maxim
Reprinted with permission

This article explains clamps, bias, and AC-coupled video signals, the appropriate signals for each, the merits and drawbacks of dual and single power supplies, and why some circuits are inherently better for some applications.

Why should you AC-couple your video signals?

If you haven't asked this question, you should. If the reason is government mandate, customer specification, or industry protocol, you're probably doing the right thing! In many cases, it's because the application has a single supply, and you feel that you must AC-couple. Maybe you still have dual supplies, because going to a single supply will involve AC-coupling the video, which will compromise the video quality.

So before we go any further, let's look at some facts. Single-supply circuits are fed by single-supply sources, such as a digital-to-analog converter (DAC), and the DAC's output can be level-translated (a DC operation) to ensure dynamic range above ground at the output. A common mistake in implementing this approach discretely is thinking that because an op amp can sense a signal below ground, it can reproduce it at the output. That's incorrect. Integrated, single-supply solutions are the real answer, but the industry will have to accept offset DC levels for their video outputs, similar to what SCART does in Europe (SCART is an industry standard for interconnecting audio-visual equipment, developed by the French company Peritel).

Of course, AC-coupling a video signal creates a problem. The signal's DC voltage level must be re-established afterwards to set image brightness and ensure that the signal falls within the linear region of the next stage. That operation, called "biasing," employs different circuits, depending on the video signal's waveform and the accuracy and stability required of the bias point. Sine-wave signals, like audio, use resistor-capacitor (RC) coupling to establish a stable bias voltage.

Unfortunately, only the chroma signal (C) of S-Video even approximates a sine wave. Luma (Y), composite (Cvbs), and RGB are complex signals that vary in one direction from a reference level, below which a sync waveform may be attached. Such signals require a form of bias method unique to video called clamping, because it "clamps" one extreme of the signal to a reference voltage, leaving the other extreme to vary. The classic form of this is a diode clamp, where the diode is activated by the sync on the video. But there are others.

For example, the color-difference signals (Pb and Pr) and graphics RGB are better handled by a "keyed clamp." This circuit replaces the diode with a switch, allowing external control of where the video is clamped using an external (key) signal. The last biasing method, called a "DC restore," adds feedback to a keyed clamp to improve the bias point's accuracy, prior to an analog-to-digital converter (ADC).

AC-Coupling Of Video Signals

When any signal is AC-coupled, the coupling capacitor stores the sum of the (signal's) average value, and the difference in DC potential between the source and the load. To illustrate how this affects the stability of a bias point for different signals, look at Figure 1. Shown is the difference between a sine wave and a pulse when AC-coupled to a grounded resistor load.

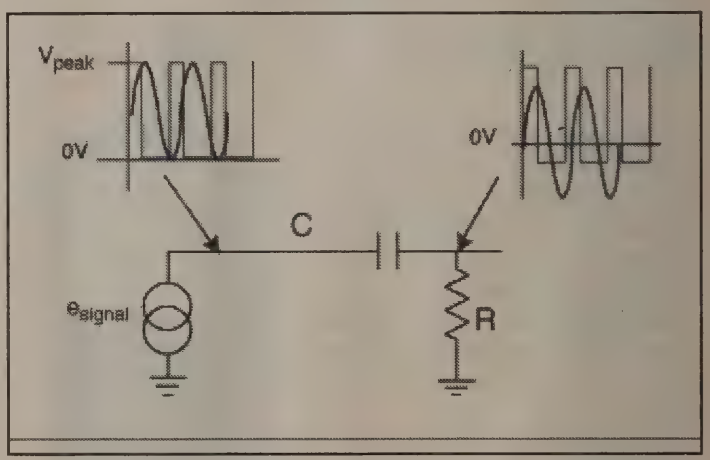


Figure 1. Simple RC coupling for a sinewave and a pulse give difference bias points.

Initially, both signals vary around the same voltage. But after passing through the capacitor, they differ. The sine wave varies around its half-amplitude point, while the pulse varies around a voltage that's a function of the duty cycle. This means that if you AC-couple, you need more dynamic range for a variable-duty-cycle pulse than for the same-size sine wave. For this reason, all amplifiers for pulse applications are DC-coupled to preserve dynamic range. Video is just like a pulse, and prefers DC-coupling.

The video signals you will likely encounter are shown in Figure 2, with the standard amplitudes found in video interfaces (see EIA 770-1, 2, and 3). Chroma in S-Video, and Pb and Pr in

component video, resemble the sine wave varying around a reference point, as noted above. Luma (Y), composite, and RGB only vary in a positive direction from 0 V (called the "black" or "blank" level) to +700 mV. This is due to a tacit agreement within the industry and not to any standard. Note that they all are complex waveforms with a sync interval that may or may not be defined or even used. For example, Figure 2 shows RGB with sync as used in NTSC and PAL formats. In PC (graphics) applications, the sync is a separate signal, and RGB doesn't have it attached. In single-supply applications, such as a DAC output, the quiescent levels could be different during the sync interval. This will influence the choice of bias method. For example, if the quiescent level of chroma isn't 0 V during the sync interval in a dual-supply application, it will be more pulse-like than sinusoidal.

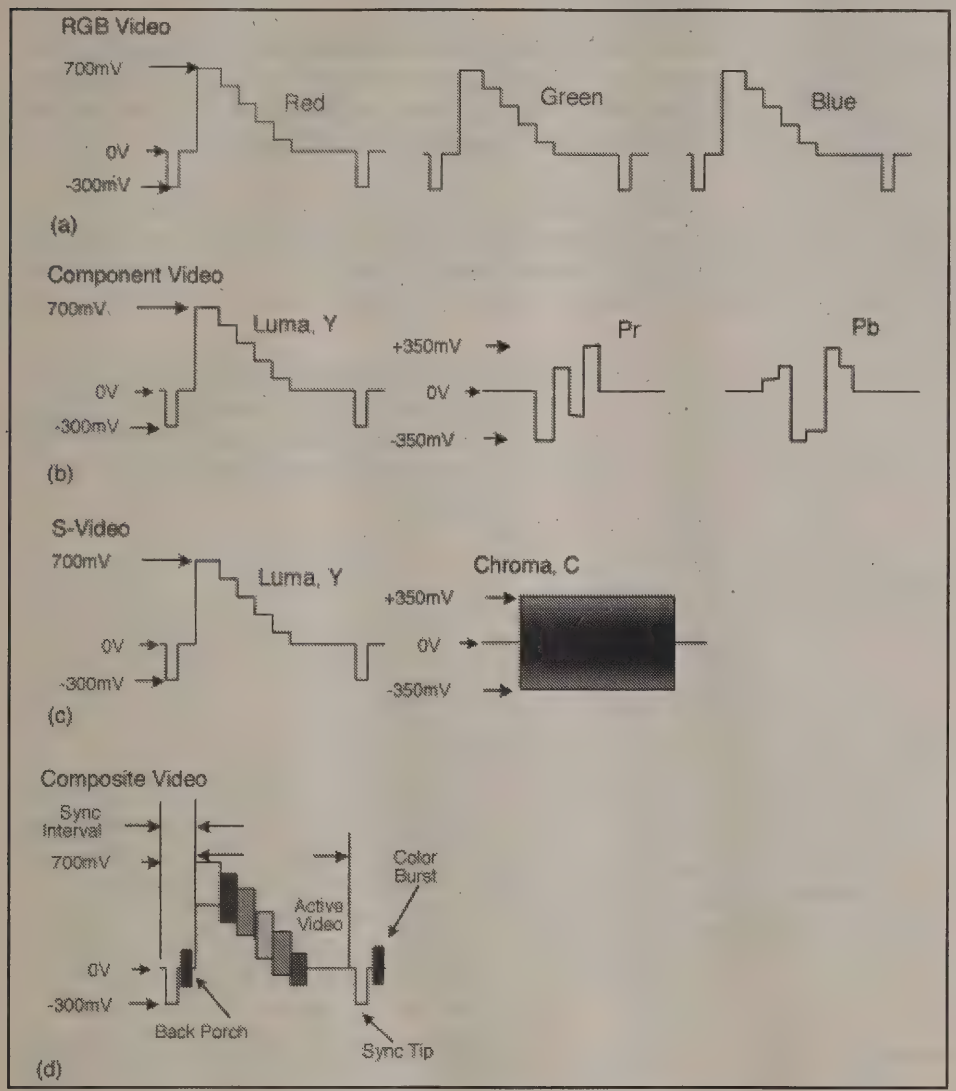


Figure 2. There RGB (a), Component (b), S-Video (c), and Composite (d) Video Signals show the Sync interval, Active video, Sync Tip, and Back Porch.

Despite these complications, video signals must be AC-coupled at the point where the voltage domains change. Connecting two different power sources through a DC connection is dangerous, and usually forbidden by safety regulations. Consequently, video-equipment makers have a tacit agreement to AC-couple the input of their equipment, and DC-couple the output—requiring the next stage to re-establish the DC component (see EN 50049-1 for PAL/DVB [SCART] and SMPTE 256M for NTSC, which allow a DC output level). Failure to establish such a protocol leads to "double coupling," where two coupling capacitors appear in series, or to a short where there are no capacitors. The sole exception to this rule is battery-powered equipment, such as camcorders and still cameras, which AC-couple the output to minimize battery drain.

The next question is how large must this coupling capacitor be? In Figure 1, the assumption that the capacitor stores the signal's "average voltage" is predicated on the RC product being greater than the minimum period of the signal. So to ensure good averaging, the lower -3-dB point of the RC network must be below the lowest frequency of the signal by a factor of 6 to 10 times. However, this results in a large range of capacitance values.

For example, chroma in S-Video is a phase-modulated sine wave whose lowest frequency is about 2 MHz. Even with a 75-O load, only 0.1 µF is required, unless you need to pass the horizontal sync interval. In contrast, the frequency response of Y (luma), Cvbs (composite), and RGB extend down to the video frame rate (25 to 30 Hz). Assuming a 75-O load, and a 3+ to 5-Hz -3-dB point, this requires greater than 1000 µF. Using too small a capacitor causes the displayed image to darken from left to right, top to bottom, and can distort the image spatially (depending on the capacitor's size). In video, this is called line droop and field tilt. To avoid visible artifacts, their levels should be less than 1% to 2%.

Single-Supply Bias Circuits For Video

RC-coupling, as shown in Figure 3a, works on any video signal, as long as the RC product is large enough. Also, the supplies on the op amp following it must have sufficient range to handle the negative and positive excursions around the signal's average value. In the past, this was accomplished by using dual supplies on the op amp. Assuming that RS is referred to the same ground as RI, and equal to RI in parallel with RF, the op amp rejects any common-mode noise (that is, its common-mode rejection ratio [CMRR] is high) with minimum offset voltage. The lower -3-db point is 1/(21RSC). Also, despite the coupling capacitor's size, the

circuit retains its power-supply rejection ratio (PSRR), CMRR, and dynamic range. Most video circuits were built this way, and most AC-coupled studio applications still are built in this fashion.

With the advent of digital video and battery-operated devices, the negative supply became a cost and power burden. Early attempts at RC bias looked like Figure 3b, which uses a voltage divider. Assuming R1 = R2 and VCC equals the sum of VCC and VEE in Figure 3a, the two circuits are similar. But they have different ac performance. To illustrate, any change in VCC in Figure 3b directly changes the op amp's input voltage by the divider ratio, while in Figure 3a it's absorbed by the power-supply headroom of the op amp. With R1 = R2, the PSRR of Figure 3b is only -6 dB. Consequently, the supply must be filtered and well regulated.

A cheaper alternative inserts an isolating resistor (RX) to improve the ac PSRR (Fig. 3c). However, this approach causes additional DC offset unless matched to the parallel value of Rf and Ri. Exacerbating this is the requirement that the RxC1 and C2Ri products must be less than 3 to 5 Hz as noted above. Although a larger bypass capacitor (C3) in this circuit allows a smaller RX and reduces the offset voltage, it also makes C1 larger. This approach can be seen in low-cost designs using electrolytic capacitors.

The alternative is Figure 3d, which replaces the voltage divider with a three-terminal regulator and extends the PSRR down to DC. The regulator's low output impedance allows RX to be closer to the parallel combination of Rf and Ri, reducing the circuit's offset voltage. Because the only purpose of C3 is reducing noise from the regulator and complementing the regulator's output impedance (Zout) as a function of frequency, its value is smaller than in Figure 3c. However, C1 and C2 can still be large, and CMRR is a problem for frequencies below the RiC1 product, as is stability.

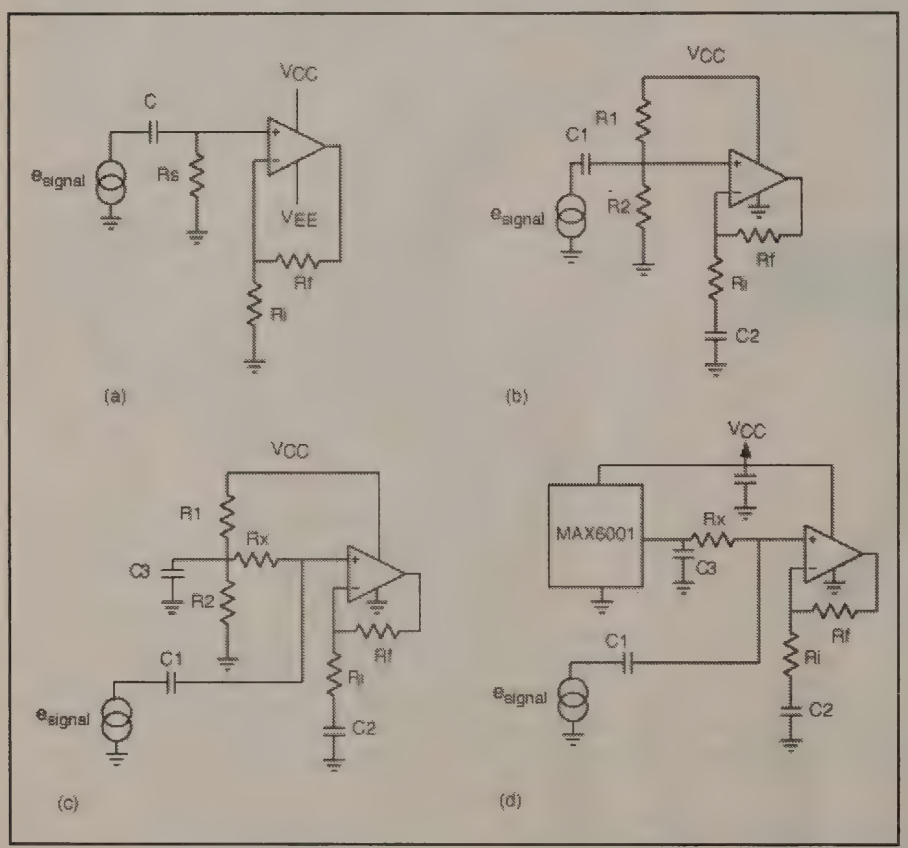


Figure 3. RC bias techniques include dual supplies (a), a single supply using a Voltage Divider (b), a voltage divider with lower offset (c), and a voltage regulator with improved PSRR (d).

After all is said and done, AC-coupling with dual supplies is better than the single-supply methods (with respect to common-mode and power-supply rejection)—regardless of the application.

Video Clamps

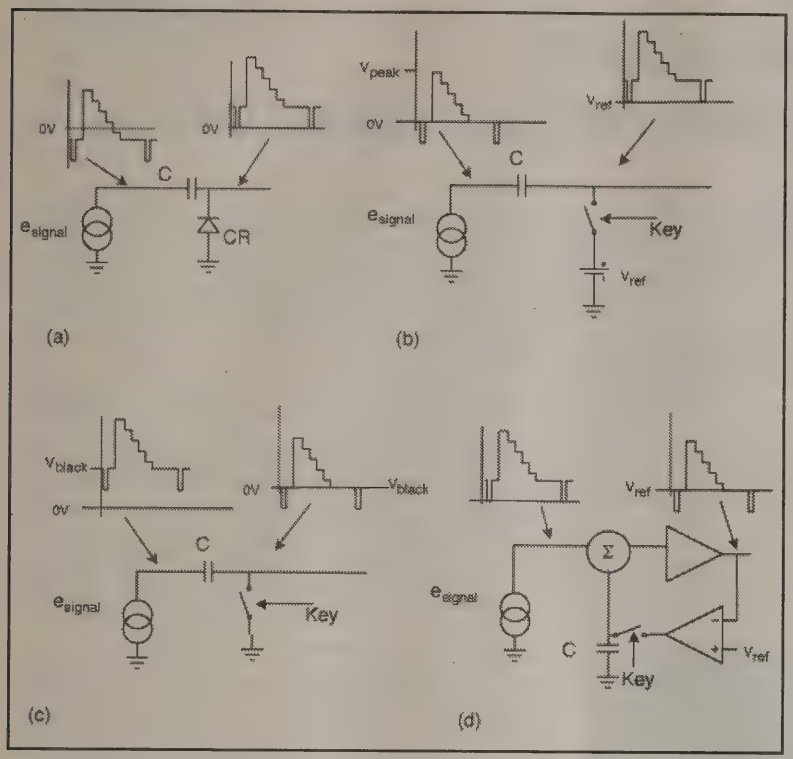
Luma, composite, and RGB signals vary from a reference level of black (0 V) to a maximum (+700 mV) with sync (-300 mV) attached. But, like the variable-duty-cycle pulse in Figure 1, if these signals are AC-coupled, the bias voltage will vary with video content (called average picture level or APL) and the brightness information will be lost. What's needed is a circuit that holds the black level constant, regardless of the video or sync amplitude.

The circuit shown in Figure 4a, called a diode clamp, attempts to do this by replacing the resistor with a diode (CR). The diode acts as a one-way switch. Thus, the video signal's most negative-going voltage, the tip of the horizontal sync waveform, is forced to ground. Hence the circuit's other name, sync tip clamp. This will hold the reference (0 V) constant, assuming the sync voltage (-300 mV) doesn't change and the diode conduction potential is zero. Although you can't control the sync level, you can reduce the conduction potential by putting the clamp diode in the feedback loop of an op amp to make an "active clamp." A major problem with these is that they tend to oscillate if improperly terminated, and are seldom used in discrete design. Integrated forms can be compensated, and are more reliable. (Examples include the MAX4399, MAX4089, and MAX4090.)

If the sync level varies or isn't present, the diode can be replaced by a switch—usually a FET controlled by an external signal (Fig. 4b). This is a keyed clamp, and the control signal is the key signal. If the key signal is coincident with the sync pulse, then this becomes a sync tip clamp. But unlike the diode clamp, it can be activated anywhere in the sync interval, and not just during the sync tip. If the key signal occurs while the video is at the black level (Fig. 4c), you get a "black-level clamp." This approach is versatile,

practical, and closely approximates its ideal model. The switch doesn't have the diode's conduction voltage, and can actually implement a black-level clamp.

Adding a DC voltage source (Vref) makes it possible to set bias for signals like chroma, Pb, and Pr, as well as composite and luma. Its shortcomings are that it requires a sync separator to get the key signal, and it's not accurate enough for some applications. If you're digitizing video, you want the black level to vary less than ±1 least-significant bit (LSB), or about ±2.75 mV. Clamps can't achieve that level of accuracy.

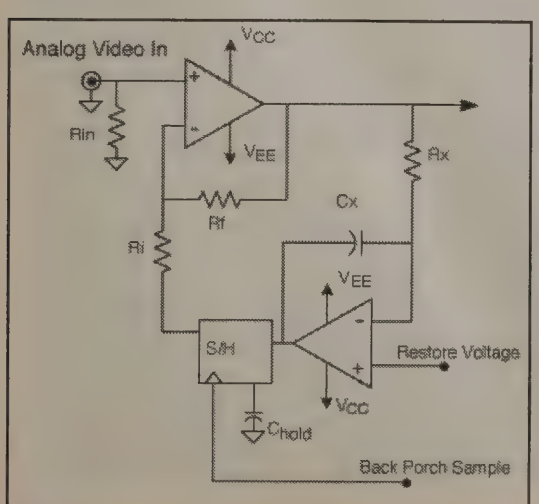


The last method used to bias a video signal is called a DC restore, and it can achieve black-level accuracy approaching ±1 LSB. The first thing you notice in Figure 4d is that this circuit doesn't have a coupling capacitor. Instead, U2 compares the DC output of the stage (U1) to a voltage (Vref), and applies negative feedback to U1 to force the output to track it regardless of the input voltage. Obviously, if the loop ran continuously, all you would get out is DC. Instead, a switch is inserted in the feedback loop. And it's only closed for an instant during each horizontal line at the point (sync tip or black level) we wish to set to Vref. The voltage is stored on a capacitor (C), but it's not in series with the input. Instead it's in a sample-and-hold (S/H) formed by the switch in the feedback.

Figure 4. Different types of Video Clamp, A) Diode or Sync Tip Clamp, B) Keyed Clamp with Reference Voltage used as a Sync Tip Clamp, C) Keyed Clam used as a Black Level Clamp, D) DC Restore

The practical implementation of Figure 5 actually has two capacitors (Chold and Cx), two op amps (U1 and U2), and an S/H. The actual comparison and signal averaging is done by Rx, Cx , and U2. The RC product is chosen for noise averaging. For a 16-ms field (NTSC/PAL), the RC product should be greater than 200 ns. So U2 is a low-frequency device chosen for its low offset voltage/current, and stability—not its frequency response. (The MAX4124/25 are good candidates for this application.) U1, on the other hand, is chosen for its frequency response, but not its offset. The S/H and Chold itself are chosen for their leakage, which causes the voltage to change (droop) during a horizontal line. Although the circuit shown uses dual supplies, it can also be implemented in single-supply form using precision level translation.

Figure 5. A practical implementation of a dc restore cicuit uses two capacitors, two op amps, and an S/H.



The biggest problem with a DC restore is that the level restored—black video to Vref—is analog, and uncorrelated with its value in the digital domain. To correct this, a DAC is often used to generate Vref. Like the keyed clamp, a DC restore can be used on any video signal (with or without sync) and activated anywhere on the waveform—assuming the amplifiers and the S/H are fast enough to follow.

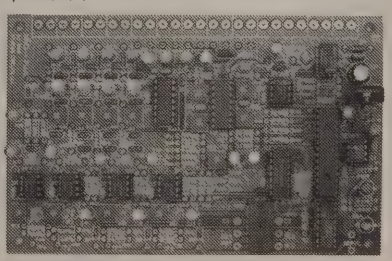
Copyright © 2005 by Maxim Integrated Products - Reprinted with permission

ATVC-4 Plus
Amateur Television Repeater Controller

ATVC-4 Plus is Intuitive Circuit's second generation Amateur Television repeater controller. ATVC-4 Plus has many features including:

- **Five video input sources**
- **Four mixable audio input sources**
- **Non-volatile storage**
- **DTMF control**
- **Beacon mode**
- **Robust CW feedback**
- **Password protection**
- **Many more features**

For example a major new feature is four individual sync detection circuits allowing for true priority based ATV receiver switching.
$349.00



Intuitive Circuits, LLC
2275 Brinston • Troy, MI 48083 • (248) 524-1918
http://www.icircuits.com

P. C. Electronics 2522 Paxson Lane Arcadia CA 91007-8537 USA ©2005
Tel: **1-626-447-4565** m-th 8am-5:30pm pst (UTC - 8) Tom (W6ORG) & Mary Ann (WB6YSS)
24 hr FAX order line 1-626-447-0489 Email: Tom6org@hamtv.com
Web site: http://www.hamtv.com

ELECTRONICS

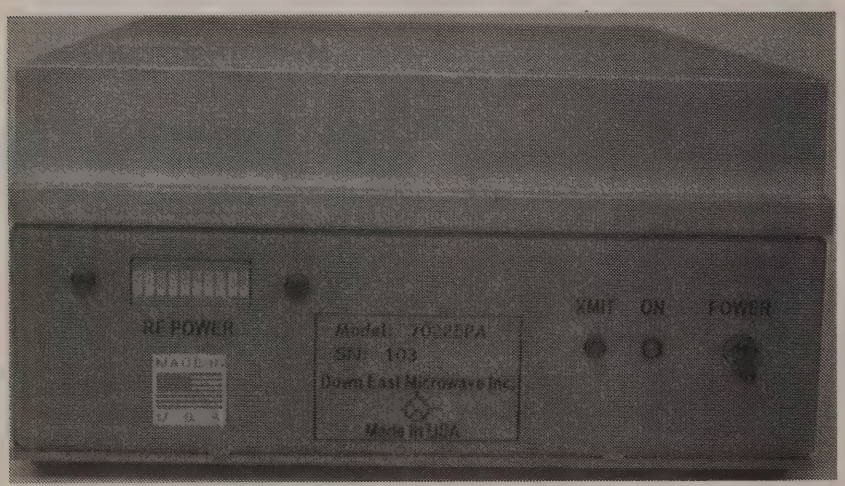
W6ORGy Notes

©July 2005

NEW Downeast Microwave 225 Watt pep 70cm Linear Amp

DEMI sent me a prototype of their new 70cm 225 Watt linear amplifier to test out on ATV. Ever since Teletec lost their heatsink facility to an earthquake in Taiwan, there has been a need for a good quality, high power linear 70cm amplifier that will work with ATV. From my tests, this amplifier may fill the bill. Downeast is kicking around a few different versions with various inputs between 4 watts and 25 watts and with or without RF T/R relays. Prices will be in the $400 to $600 range, again depending on features.

The great linearity is due to the use of a 28 Vdc power FET. Most 12V silicon power transistors gain curve start bending over at about 1/2 their rated output and require ATV transmitter to have both output (sync tip or pep) and blanking pedestal adjustments - commonly called sync stretchers - to process the video so that the transmitted video to sync ration is maintained. This amp was very linear up to 150 watts pep without the need for sync stretching. This means that the new Videolynx VM-70X transmitter which has no sync stretching, but does have pep (peak envelope power) drives this amp to 150 Watts pep nicely with just under 5 Watts pep drive.



Downeast Microwave 70225PA

Final version will have two cooling fans mounted on the top of the heatsink and look similar to their new 23120PA 23cm amp which you can see on their web site. Size is 10" x 7" x 4". DC power requirement is 28Vdc at up to 12A. Downeast is also working on a 28Vdc switching regulator power supply with a capability of up to 20A. They will design for low switching regulator output spikes which can put noise in AM ATV transmissions.

I tested the amplifier with one of our TC70-20Sa ATV transceivers since they are adjustable from over 20 watts to actually below 1 watt pep RF output. I did not have a 28V supply, so I hooked two Astron RS-20M supplies in series and adjusted one for a total of 28.0 Vdc. A line sampler on the output and connected to a scope was used to look a the linearity of a gray scale and a frequency multiburst applied video to the TC70-20Sa plus amp combination. Insignficant video rolloff, intermod or other distortions were noted. Power measurements were taken from an IFR 1200S Communications Monitor digital readout in the peak power mode - yes, I know the load is rated at 150 watts, but I had my fingers crossed and keyed down just long enough to make the reading.

Input	Output	Current
1.4	53	5.5
2.8	100	7
5.1	156	9
10	218	10

All power is sync tip or pep.

Set up is easy if you have a RF power meter for the level and band. You can also come close by driving up to 10 Amps then setting the pedestal for 7.5 A . First, with no video connected, set the pep - sync tip power to less than 5 watts. Connect to the amp and adjust to the desired pep - we suggest 200 Watts maximum so as to have some headroom for the sound which rides on top of the sync. Set the pedestal pot to 56% of the pep value - 112W in the case of 200 pep. There is a LED output indicator that will vary with what is in the picture.

P. C. Electronics 2522 Paxson Lane Arcadia CA 91007-8537 USA ©2005
Tel: **1-626-447-4565** m-th 8am-5:30pm pst (UTC - 8) Tom (W6ORG) & Mary Ann (WB6YSS)
24 hr FAX order line 1-626-447-0489 Email: Tom6org@hamtv.com
Web site: http://www.hamtv.com

W6ORGy Notes

©July 2005

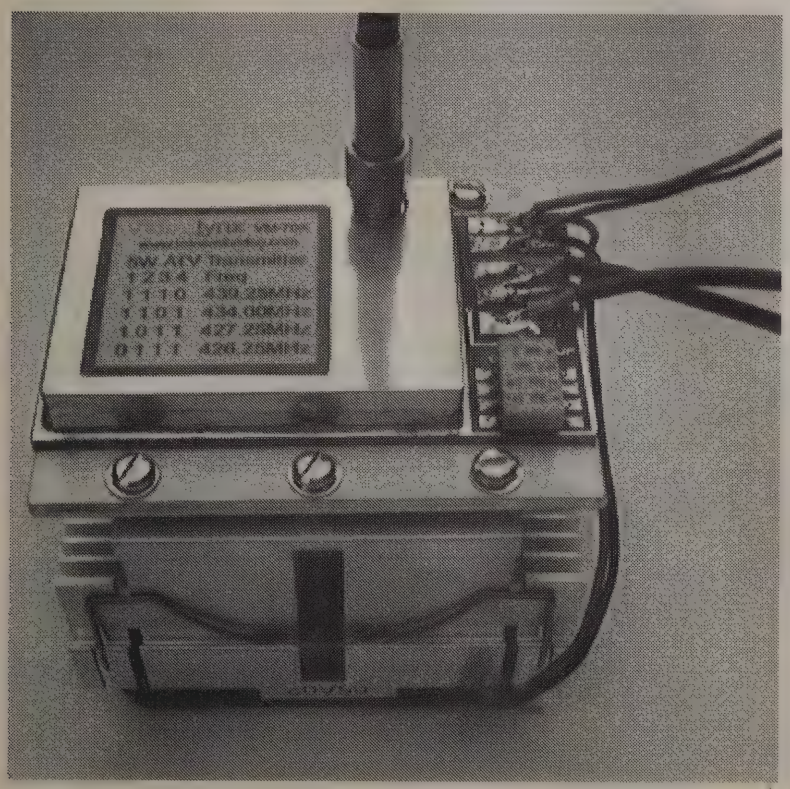
NEW Videolynx 0-4Watt 70cm ATV Transmitter Module

Ravi, KA3NNJ, can't resist miniaturizing ATV transmitters with the latest high tech IC's. The VM-70X is his latest which is only 2.35" x 2.8" x .75", 1.8 oz, 4 channels, sound, and puts out over 4 Watts. Some have been asking for a little more power than 50-100 mW as found in his Z70A. A pot on the board will adjust the output power anywhere from 0 to over 4 Watts. 4 channels are digiswitch selected: 426.25, 427.25, 434.0 or 439.25 MHz. The video and audio carrier are locked to the same crystal. The board accepts line level video and audio. With this unit you can run up to 1/2 Watt out without having to add a heatsink for up to 20 minutes assuming there is free air around it. This is fine for most R/C aircraft flights. The unit will work on any DC Voltage from +11 to 14.0 Vdc.

For longer time periods or restricted packaging, a heatsink needs to be bolted to the mounting plate or air blown over the unit so the maximum temperature of 149 degrees F is not exceeded. The table below shows the power, current draw at 13.8Vdc and time to reach 149 degrees from about 80 degrees with the transmitter sitting on the bench and 5 degrees per minute cooling time in-between transmissions. Obviously, for most applications, an additional heatsink and/or fan will have to be used for repetitive transmissions.

Output	Current	Time to 149F	time per degree
0.5	.35	23 min	21 sec
1.2	.48	5 min	8.5 sec
5.0	1.0	1:50 min	3 sec
0	0	5deg/min cooling	

All power is sync tip or pep.



The VM-70X module comes fastened to an aluminum plate which can in-turn be bolted to a chassis or heatsink with 6 4-40 screws and the mating surfaces covered with a thin layer of heat sink compound. As can be seen, the heat needs to be removed for long or repetitive short key down periods so that 149 degrees is not exceeded and possible damage to the module.

An excellent solution for higher power R/C, rocker or balloon applications is to bolt a Radio Shack CPU Cooling Fan (273-153) to the mounting plate. The fan draws about 200 mA at 13.8Vdc. Placing the transmitter over the heatsink, I marked the locations of the 6 holes. Then I center punched and drilled each one about 3/8 of an inch with a #43 drill. Then tapped for a 4-40 x 3/8 screw and deburred. A little fine sandpaper will remove any bumps before applying heat sink compound. Mount the transmitter as shown with the heatsink gap on the digiswitch side - hottest side is diagonally across. Connect the red fan wire to the 12V solder pad and black to ground. Cut the unused yellow wire short.

With this set up I was able to transmit for 1 hour with the temperature rising up to no higher than 100F.

NEW PRODUCTS FROM HARLAN TECHNOLOGIES!
LIMITED SUPPLY

Color CCTV Camera Package
With Varifocal Lens and Stand!

Two models

Color CCTV Camera
NTSC - 420 Line - 1.0 Lux - F1.2

Color CCTV Camera - Day/Night
420 Line - 0.5 Lux Day (Color) / 0.01 Lux Night (B&W)

All prices plus shipping - If in Illinois - add 7.25% tax

Color CCTV Camera Package
With Varifocal Lens (6-15 mm - f1.4) and Stand!

Complete package Only $119.00

Color CCTV Camera - DV-4100C
Sharp 1/4" CCD
NTSC
420 Line
1.0 Lux - F1.2
1 Vp-p 75 O
Auto White Balance
S/N Ratio - More than 46 db
Electronic Shutter - 1/60-1/1000,000 Sec
Lens - C/CS Mount - 6-15 mm - f1.4
Power - 12V±10%DC - 100 ma.
Small size - 40x40x54mm
Power supply and cables not included.

Day / Night Color CCTV Camera Package
With Varifocal Lens (6-15 mm - f1.4) and Stand!

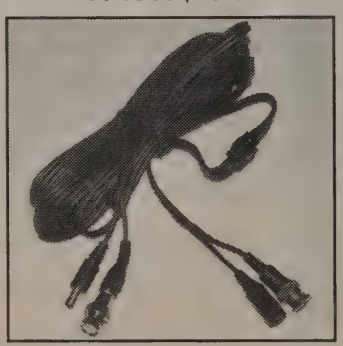
Complete package Only $169.00

Color CCTV Camera - DV-4400CDN
Sony 1/3" CCD
NTSC
420 Line
0.5 Lux Day (Color) - 0.01 Lux Night (B&W) - F1.2
1 Vp-p 75 O
Auto White Balance
S/N Ratio - More than 46 db
Electronic Shutter - 1/60-1/1000,000 Sec
Lens - C/CS Mount- 6-15 mm - f1.4
Power - 12V±10%DC - 100 ma.
Small size - 40x40x54mm
Power supply and cables not included.

---

12 Volt - 300 ma. Wall Transformer
$6.00

Video & Power 2.1 mm Cable - 25 feet RCA to BNC
$14.95
50 foot $19.95



Mini Tridpod Folds to fit in pocket
$6.95

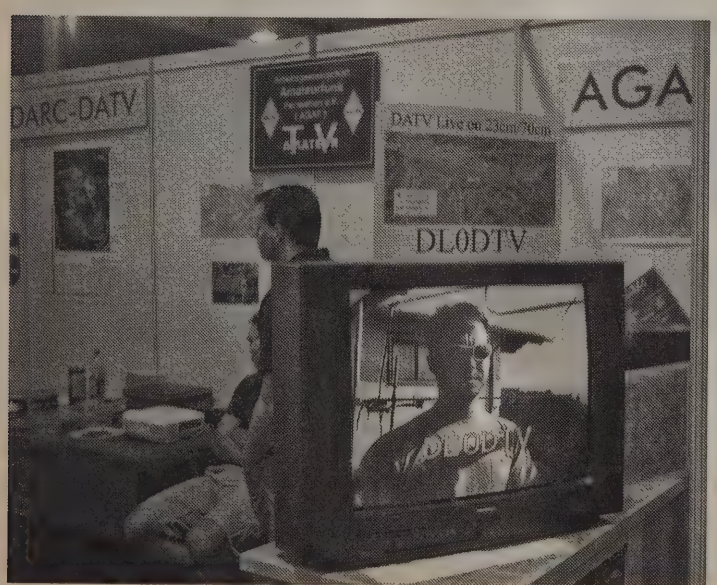
5-Section Tripod Legs extend to 7 1/2"
$14.95

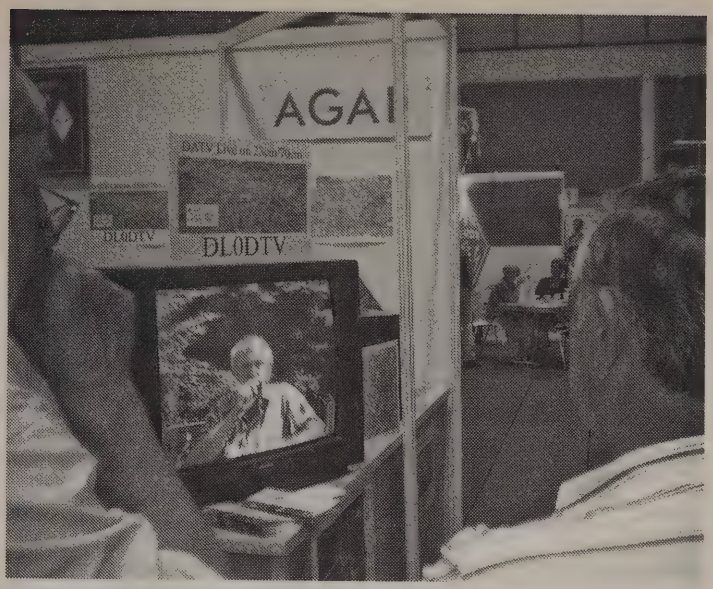
AGAF at HAM RADIO Fair 2005 in Germany

With 30 degrees Celsius outside we were lucky to have a cool atmosphere inside the hall A1at the 30th International Exhibition for radio amateurs in Friedrichshafen end of June. Only the live video link from the Pfaender mountain in Austria beyond Lake Constance remembered us at the AGAF stand of the heat at the outpost. Some students from the Wuppertal University engaged in the DATV development were with us working as technical consultants or as cameramen like Andre, DO1AAW. When the DARC staff came around with officials from the Department of Trade and Industry, Uwe, DJ8DW, explained the status of digital amateur television. Many hams from different countries asked the AGAF team with Heinz, DC6MR, and Klaus, DL4KCK, for technical details or received their TV-AMATEUR issue #137 hot off the presses. On a video monitor spectators saw themselves acting lagged because of the typical MPEG delay time through the DATV TX on display, and via laptop and graphical control software the hard-disc integrated into the DATV exciter played back some of the scenes recorded before.

On Saturday Uwe, DJ8DW, and Willi, DC5QC, realized this year`s peak level of AGAF activities at HAM RADIO: live video sent via GMSK modulation on 434 MHz (2 MHz hf bw) with 7 Watt from the german bank of Lake Constance over 20 km to Pfaender mountain and from there back to the fair hall in Friedrichshafen over 28 km via QPSK modulation on 1255 MHz with 8 Watt. After a short lunch break another portable GMSK link was established from the Gehrenberg over 38 km. At the receiver monitor several OMs congratulated, i.e. DC0BV, DJ3DY, and DK7EI.

Heinrich, DC0BV, was also delighted by encouraging news about ham radio in space, which he served in a very active role at times of the russian space station MIR. But before the envisioned ATV links could emerge the whole station was dumped into the pacific ocean. ON4WF reported in his lecture at the





HAM RADIO fair about future ARISS activities. In July 2005 the ISS astronauts will dump an old russian space suit equipped with electronics and ham gear into an orbit during a space walk. In the following weeks that "Suitsat" will transmit around the clock several greeting messages in different languages from children all over the world on 144.990 MHz with 500 mW, additionally an SSTV image stored in the same chips.

A much more impressive impact on the public is expected from the future ham radio traffic on board the new european ISS laboratory "Columbus" constructed now. It shall get ham radio antennas for 70 cm, 23 cm, and 13 cm, enabling first ARISS contacts on SHF. With the Columbus module being located at some considerable distance from the other two ARISS stations, this will permit parallel operations on the new bands at the same time as the existing operations. The availability of these new frequencies will enable us to establish wideband and video operations for the first time. This facility will provide ATV facilities for School contacts and, additionally, continuous transponder operation. Uwe, DJ8DW, assured ON4WF face to face of a donation of AGAF DATV equipment for ARISS. ESA has decided to cover the installation cost of the ARISS antennas on Columbus exceeding 100.000 euro (coaxial feedthroughs, coax cables on the hull of the module, etc.) completely, but for development and manufacturing of the antennas your donations are still needed, see **http://www.ariss-eu.org/columbus.htm**

Klaus, DL4KCK - **www.agaf.de**

ATVQ

For Sale

It is a WTB: 1.2 GHz high power amplifier 35 to 100 watts for AM use on 1289.25 or complete parts to build one. Please contact Ron, W6BR at w6br@sbcglobal.net or call me at (707) 478-2875 - 73, Ron, W6BR

Thank you Gene and keep up the good works with the magazine! When are you going to come out with a monthly one?? :-)

ATVQ

ATVQ TO PAY FOR ARTICLES!

Payment for Technical Articles

ATVQ will pay for certain articles that it publishes. I will outline the policy here, but it will be subject to change as needed to make sure that ATVQ continues to be an ongoing publication. ATVQ will pay $25.00 for technical articles that are published and are a minimum of 2 pages. While this is not a great amount, I hope it will encourage more technical type articles to be written. Exceptions will be articles that are written by a manufacturer/seller of equipment that is being written about. While I do not want to discourage this type of article, the article itself is an advertisement of the product. Articles from clubs will be encouraged, and I would expect they would like to share their information with the ATVQ readership. Information gathered from the Internet will not be paid for and is mostly small filler items.

Ideas

Do you have an idea for an article that you've said to yourself that you wanted to write, but never did. Feel free to check with us to see if it is of interest, or write and send it in. No guarantees that it will get published, but if you don't try, you will never know. I'll be looking to see what you can do!

CONTRIBUTORS GUIDE

Preferred method of receiving articles is from **Microsoft Word**, however **Wordperfect** is OK too. Next preference would be **ASKII text**, followed by **typewritten** or **hand written** (clearly). Diagrams or pictures (B&W or Color) can be sent in hard copy, or if you scan them in, save to PCX or JPG formats (actually I can read about anything). If you send a computer disk, make sure it is PC (not MAC) format.

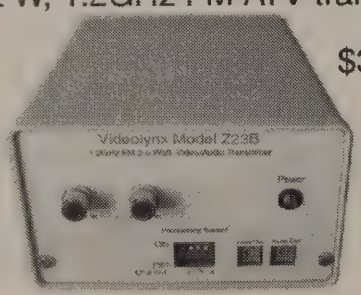
When sending in articles in Microsoft Word, please SAVE with FASTSAVE OFF and save in Word 6 format. Also, articles written in any word processor, consider what will happen when it is re-formatted to fit the style that I might put it in. An example would be setting up tables or adding figures into the article. They can be very hard to strip out. If possible, put the tables, figures, each in a file by itself. This will help me to be able to import into the magazine format.

Articles can be sent to:
ATVQ, 5931 Alma Dr., Rockford, IL 61108

or to our email address: **atvq@hampubs.com**
Also note our web page address: **http://www.hampubs.com**

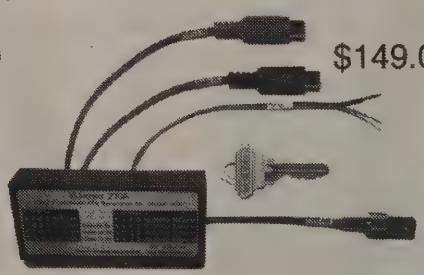
High quality ATV transmitters by Videolynx

Model Z23B
2 W, 1.2GHz FM ATV transmitter
$349.00



4 Channels with PLL control
Up to 16 channels by order
NTSC pre-emphasis
5.5MHz audio
Broadcast quality
12V, at 1.5 amps

Model Z70A
70cm Mini transmitter
$149.00



Built in video/audio TEST signal
4 PLL controlled channels
Cable Channels 58, 59, 60
100mW output, 4.5MHz audio
Only 3.5 ozs, great for R/C
9V, 250mA

Model 434
434MHz micro transmitter
$99.00

100mW output
Cable channel 59
Only 1.5 ozs
9V, 40mA
Perfect for R/C

www.transmitvideo.com PC Electronics (626) 447-4565

Thanks to all the fine stores that carry Amateur Television Quarterly

Amateur Accessories
PO Box 7333
Champain, IL 61826

Amateur Radio Toy Store
117 West Wesley Street
Wheaton, IL 60187

Burnaby Radio Comm Ltd.
4257 E. Hastings St.
Burnaby, BC Canada V5C 2J5

Dave's Hobby Shop
600 Main St.
Van Buren, AR

Ham Radio Outlet
1939 W. Dunlap Ave.
Phoenix, AZ 85021

Ham Radio Outlet
6071 Buford Hwy
Atlanta, GA 30340

Ham Radio Outlet
224 N. Broadway
Salem, NH 03079

Ham Radio Outlet
2492 W. Victory Bl.
Burbank, CA 91506

Ham Radio Outlet
933 N. Euclid St.
Anaheim, CA 92801

Radio City
2663 County Rd I
Mounds View, MN 55112

The Radio Place
5675 A Power Inn Rd.
Sacramento, CA 95824

Do you know of a store that would like to carry ATVQ? Please let us know and we will contact them.

ADVERTISERS INDEX

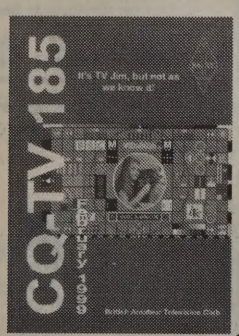
Amateur Television Quarterly 22,23,38
ATV Research .....Cover 4
CQ-TV 41
daveswebshop 42
the HAM STATION 42
Intuitive Circuits, LLC 3,35
M2 42
Mann's Rotor Service 3
Multilabs 13
Name Tags by Gene .....Cover 3
Pacific Wireless 5
PC Electronics .....Cover 2
R.F. Connection 7
The K1CRA Radio WebStore 3
TV-Amateur 42
VHF Communications 3
Videolynx 40

Please mention that you saw it in
Amateur Television Quarterly!

ATVQ on the Newsstands

If you find a store willing to carry ATVQ on their shelves, we will extend your subscription by one year. In the case that two people turn in the same store, the first one wins! Offer subject to change at any time, but not likely to!

Interested in the technical side of Television?



The British Amateur Television Club

BA TC

Fifty Years in Television 50

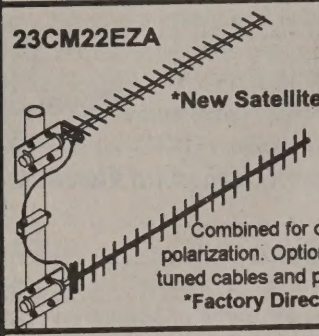
1949 - 1999

Visit our web site at http://www.batc.org.uk

YOUR ATV AND SATELLITE ANTENNA SOURCE...

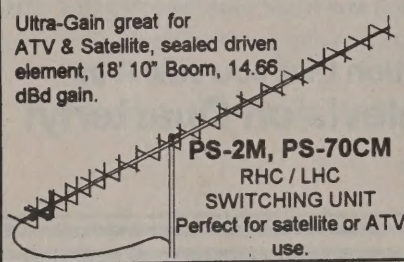
***New ATV 432 Package**
Completely redesigned for the ATV frequencies. Perfect match, 8.4 dBd of gain over ground.
Factory Direct Only

23CM22EZA

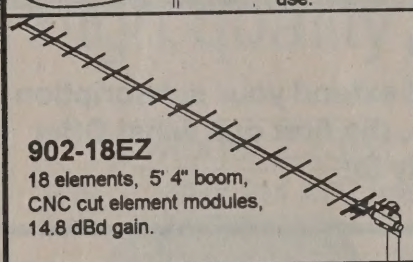


***New Satellite Array**
Combined for circular polarization. Optional factory tuned cables and pwr divider.
Factory Direct Only

436CP42UG
Ultra-Gain great for ATV & Satellite, sealed driven element, 18' 10" Boom, 14.66 dBd gain.

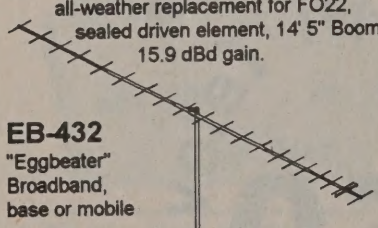


PS-2M, PS-70CM
RHC / LHC
SWITCHING UNIT
Perfect for satellite or ATV use.

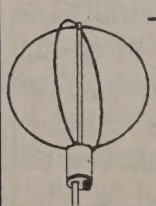


902-18EZ
18 elements, 5' 4" boom, CNC cut element modules, 14.8 dBd gain.

440-21ATV
all-weather replacement for FO22, sealed driven element, 14' 5" Boom, 15.9 dBd gain.



EB-432
"Eggbeater" Broadband, base or mobile



- Fiberglass crossbooms
- Power Dividers
- Phasing harnesses
- Stacking frames
- AZ, EL Positioners

M² 4402 N. Selland Ave.
Fresno, CA 93722
(559) 432-8873 FAX: 432-3059
Website: www.m2inc.com

ADVERTISE HERE!

THIS SPACE IS WAITING FOR YOU!

Satellite Equipment
C & Ku Band

Lnbs Lnbfs * Feed Horns
Dish Antennas * Actuators/Movers
Switches/Splitters * DiSEqC * 22 KHz
Mpeg-2 & Analog Receivers * Much More !

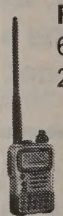
www.daveswebshop.com

479-997-2230 Noon-5 PM CST M-F

YAESU

FT-2800
65 Watt
2 meter mobile

FT-897
MF/HF/VHF/UHF
Transceiver
160 - 10 meters plus 6, 2 & 70 cm



VX-7R
50/144/430 MHz
FM, Handheld

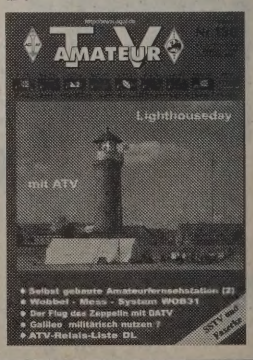
Price and Availability Subject To Change Without Notice
Most Orders Shipped The Same Day!

LARGE SELECTION OF USED GEAR

the HAM STATION
220 N. Fulton Avenue
Evansville, IN 47719-0522
Store Hours (CST)
Mon-Fri 8AM-4PM
Sat: 9AM - 3PM
ORDERS & PRICE CHECKS
800-729-4373
LOCAL INFORMATION
812-422-0231
Fax 812-422-4253
email: sales@hamstation.com
http://www.hamstation.com
Prices Do Not Include Shipping

TV-AMATEUR die deutsche Amateurfunk-Zeitschrift für ATV bringt in der letzten Ausgabe z. B.

- Selbst gebaute Amateurfernsehstation
- SSTV und Fax
- Wobbel - Mess - System WOB31
- Der Flug des Zeppelin mit DATV
- Galileo militärisch nutzen ?



4 Ausgaben im Jahr für 25 $
bestellen per Fax: 001149 231 486989
oder Internet: www.agaf.de
Bezahlen per Visa- oder Mastercard

Name Tags by Gene

New from Harlan Technologies - beautiful, colorful, plastic name badges! Available with locking safety pin, magnetic bar, luggage strap, or lanyard.

These colorful badges can be made from our sample artwork, or if you like to be creative, you can make your own. Great to have a club badge with your club logo, or for proper identification with group such as ARES.

Prices

Badge with safety pin.....$10.00
Badge with magnetic bar $12.00
Badge with luggage strap.....$10.00
Badge with lanyard.....$10.00

You must see our many designs on our web page:
www.hampubs.com
Order your new name tag today!

Name Tags by Gene

Beautiful COLOR name tag / badges with photos, artwork, or plain colored backgrounds.

Design # from book _____ or
Background color _____ or
Picture file name _____

Picture insert #1 _____
Picture insert #2 _____
Picture insert #3 _____

TEXT
Line #1 _____
Line #2 _____
Line #3 _____
Line #4 _____
Line #5 _____
Line #6 _____

Name _____ Call _____
Address _____
City _____ State ___ Zip _____
Phone _____
QTY _____ @ $10 = $ _____
QTY _____ @ $12 = $ _____
QTY _____ @ $10 = $ _____
QTY _____ @ $10 = $ _____

Credit Card #_____
Expires _____

Signature _____
SPECIAL
Shipping FREE in the USA till December 31, 2003

Harlan Technologies
5931 Alma Dr.
Rockford, IL 61108
815-398-2683 voice --- 815-398-2688 fax
www.hampubs.com

ATV Research Inc.

Wholesale Only

Video Catalog
2005B

CCTV * MATV * SMATV
since 1964

Request your free 2005B Catalog TODAY!

When it comes to video...we think outside the box! We invite you to join us!

Note: This catalog is available only to licensed ARS holders, dealers, and qualifying businesses and agencies.

(800) 392-3922 or (402) 987-3771 24 hr fax: (402) 987-3709
Website: www.atvresearch.com Email: sales@atvresearch.com